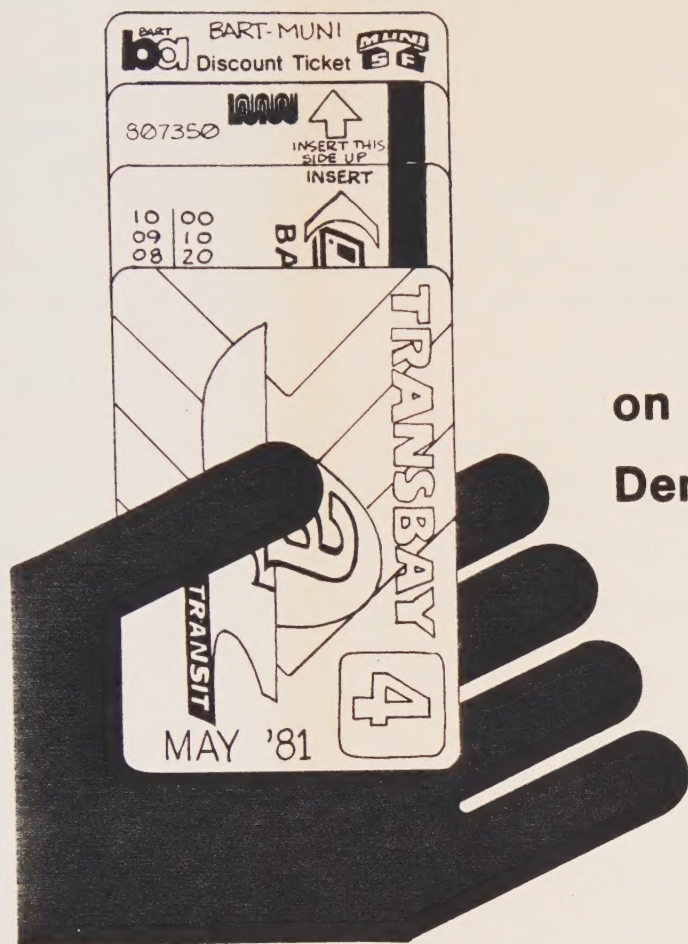


# Conceptual Plan for Multi-Operator Joint Transit Fares in the San Francisco Bay Area



## Volume III of the Final Report on the Joint Fare Prepayment Demonstration Design Project

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Research Report

JOINT TRANSIT FARES IN A MULTI-OPERATOR REGION

A Conceptual Plan for the San Francisco Bay Area

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Luther Freeman (Chairman from April 1, 1980) — Municipal Railway  
Howard Goode — Bay Area Rapid Transit District  
Jerome Kuykendall — Golden Gate Bridge District  
Don Larson — AC Transit District  
James Lightbody — Santa Clara County Transit District  
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Todd Dunn and John Sullivan were research assistants on this project

Despite this wealth of assistance, however, the authors take full responsibility for the contents of this report.

## CONTENTS

Acknowledgements .....	ii
Summary .....	v
I. The Problem .....	1
II. The Setting .....	3
III. The Market .....	17
IV. The Issues .....	22
V. Methodology for the Joint Fare Plan Design.....	51
VI. Design of a Joint Fare Plan .....	55
VII. Implementation Stages .....	82
VIII. Project Monitoring Guidelines.....	85
Appendix A — Abbreviations and Short Names.....	89
Appendix B — System-by-System Appraisal of Operator Attitudes Toward Possible Joint Fare Prepayment Schemes .....	90
Appendix C — Basis for Calculations of the Effect of Honoring Muni Monthly Passes on BART for Intra-San Francisco Trips .....	99



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## SUMMARY

Transit service in most large U. S. metropolitan areas is provided by more than one operator. Trip desires, however, do not respect artificial jurisdictional boundaries. Hence a part of the existing and potential transit riding market is inconvenienced by having to pay fares to two or even three carriers, unless some arrangements are made for joint fares. Occasionally, ad hoc agreements for intercarrier transfers are consummated, but no systematic regionwide joint fare system has been developed.

This report analyzes this problem with specific application to the San Francisco Bay Area in California. This region provides perhaps an extreme example of the problem, since it is served by seven major carriers and a number of smaller ones. Approximately one million transit trips are made in the region each weekday; it is estimated that about 10 percent of these trips involve at least two of the systems operating in the region.

A separate concern in the transit industry is increasing the efficiency of fare payment, because of the time and costs incurred when many transactions take place on board surface vehicles or at rail station fare gates. One method of addressing this problem is the promotion of fare prepayment, which replaces many individual cash payments or ticket purchases and subsequent counting and accounting tasks by fewer larger transactions. Prepayment may be in the form of stored-fare magnetic tickets of high initial value, books of ticket coupons, or passes. The design of a joint-fare system recognizes that the complexity of implementation and continuing administration is a function of the number of transactions involved. Inclusion of a prepayment scheme used by a large number of commuters is therefore considered an essential component.

Many types of joint-fare systems could be devised, but a successful one must meet the criterion of acceptability by the participating operating systems in very broad terms: operators must feel that their own set of goals and methods of achieving them are not disrupted, employees must find the new tasks involved simple and not burdensome, and passengers must not be inconvenienced or confused to the point where this might result in patronage reduction or poor public relations. A rather detailed discussion of the issues and attitudes underlying the problem of acceptability is found in Chapter IV and Appendix B.

The kind of joint-fare plan which can be introduced in a region such as the San Francisco Bay Area is described in Chapter VI. It follows the basic principle of maximizing "home rule" and minimizing the need of each system to make



changes to accommodate the plan. It consists of two principal elements, although other facets can be added if desired.

1. Monthly Passes. Multisystem monthly passes are proposed. These are based on monthly passes already offered by some systems, with the hope that those systems not presently offering this form of prepayment will do so. In the case of BART, the introduction of monthly passes involves not only hardware changes at the fare gates (which are the subject of an in-house study at BART) but also policy decisions about the type of pass to be offered. It is proposed that the BART pass be of a form which permits an unlimited number of trips within the month, none of which exceeds the "face value" of the pass, and that such a pass be priced at from 36 to 40 times the "face value."

Intersystem monthly passes are then created by combining passes of individual systems. Technologically, the passes will be of a magnetic form identical to BART's stored fare tickets and almost identical to the monthly pass produced for the Municipal Railway. Financially, the price of the passes will be set at the sum of the cost of the individual passes less ten percent for "end-to-end" connections or at the price of the rail pass plus 18 single fares of the feeder system in the case of "feeder" connections. Some variations to this general formula are possible and, in certain circumstances, necessary.

Each system will receive as revenue an amount representing the cost of its own pass. The discount offered is recouped from a regional transit subsidy fund through a central accounting procedure. In order that the farebox recovery ratio of each system not be reduced by this procedure, it is proposed that the discounts be treated as fractions of the passes purchased by governmental bodies on behalf of passengers who pay the remaining major fraction.

2. Single-ride Tickets. Because fares for single trips are paid on surface vehicles or at stations at the time of entering rail systems, intersystem single-ride tickets present a more complex problem. This can best be solved in one of two ways:

- a. Introduction of self-service fare collection throughout the region, requiring the installation of ticket vending machines at all major surface transit stops and the employment of roving inspectors to control fare paying. Fareboxes on surface vehicles would be eliminated.

- b. Development of electronic transfer printers which are installed in combination with electronic fareboxes in surface vehicles.

The first of these alternatives is unlikely to be implementable in the entire region in the foreseeable future. Hence the second alternative is proposed. Electronic fareboxes which count individual fares and process dollar bills are already beginning to be purchased. Transfer printers, with the ability to store a fairly complex fare matrix, issue individually printed transfers, and keep accounts, are still in early development stage. If and when introduced, they will not only enable administration of the single-trip joint fares but also replace present transfer ticket systems.

Pricing of joint-fares and reimbursements to the carriers to replace the discounts offered will be similar to the schemes proposed for monthly pass financing.

The extent to which joint-fare passes in the near future and joint fare single-ride tickets at a later date might be used, together with the subsidy requirements involved are tabulated in Table A. It must be kept in mind that, because of the many assumptions which had to be made, and because of the imprecise data to which these were applied, all results are very rough and should be considered as order-of-magnitude figures.

The monthly pass portion of the joint-fare plan could be implemented in stages beginning almost immediately. Inclusion of BART in this part of the scheme depends on progress of the work to modify BART's fare gate hardware and software as well as on the decision about the type of pass pricing structure to be adopted for intra-BART trips. The single-ride joint-fare program could be implemented on an interim basis at a few minor system interfaces in the near future, but the general program awaits development and installation of the equipment referred to above; it appears realistic to estimate that this event is still a number of years in the future.



TABLE A - USE OF JOINT FARES AND SUBSIDY REQUIREMENTS

<u>1. Monthly Passes</u>		
Corridor Project	Monthly Use (Number of Passengers Purchasing Passes)	Annual Subsidy (Thousands of Dollars)
BART/Muni/AC	10,000 - 16,000	925 - 2,900*
Southern Pacific	4,000 - 4,700	375 - 875
All Others	1,900 - 2,200	150 - 175
Totals (rounded)	16,000 - 23,000	1,450 - 3,950*
<u>2. Single-Ride Tickets</u>		
Corridor Project	Number of Annual Rides (Millions)	Annual Subsidy (Thousands of Dollars)
BART/Muni/AC	16.0 - 17.2	1,250 - 1,300
Southern Pacific	0.6 - 0.9	250 - 300
All Others	4.0	750
Totals (rounded)	20.5 - 22.0	2,250 - 2,350
<u>3. Totals for Complete Program</u>		
Corridor Project	Number of Annual Rides† (Millions)	Annual Subsidy (Thousands of Dollars)
BART/Muni/AC	22.0 - 27.0	2,175 - 4,200*
Southern Pacific	3.0 - 3.7	625 - 1,175
All Others	5.0 - 5.3	900 - 925
Totals (rounded)	30.0 - 36.0	3,700 - 6,300*

† - Assumes that each pass purchaser makes 50 trips per month.

\* - Upper end of range speculative; see Chapter VI, Section A.8.

## I. THE PROBLEM

A metropolitan region is served by a number of transit systems. Some of these have exclusive territories, while others overlap each other. All systems are publicly owned, but are beholden to different electorates with differing subregional goals and viewpoints.

At the same time, economic, social, environmental, and political conditions require that transit service generally become more attractive and more competitive with the automobile. Trip desires within a region do not respect artificial transit district boundaries. In a car, travelers cross such boundaries without being aware of them; by transit, the interface between systems becomes a major physical and financial obstacle.

Obviously, cooperation and coordination among transit systems can alleviate the loss of money and time at system interfaces. In practice, such actions are not easy to achieve. There will be general support for the concept of joining together in certain actions, but actual implementation requires solving physical and financial problems without violating the goals of the individual participants.

In this study, the problem of joint fares is analyzed. This is a relatively complex problem, and therefore has been relegated to a low rank on many priority lists after such relatively easy programs as schedule coordination, joint programs for transit information, and ad hoc transfer arrangements between two systems.

Many metropolitan areas in the United States face the situation described here. For numerous reasons, one of which is a general reluctance nationwide to create metropolitan general-purpose governments, all the largest ones have failed to merge their transit systems into a single entity. (Washington, D.C. is the largest region which comes close.) However, because of differences in state laws (not to mention the fact that some regions cover more than one state) and of regional attitudes, it is unlikely that any solution can be developed in a laboratory and then recommended to the entire country.

This study therefore deals with an analysis of one specific area, that of the San Francisco, California, region. It points out many of the considerations which arise when the problem of joint fares is addressed, and how some of the problems may be overcome. Some solutions may be usefully employed in other regions, others will apply only in the San Francisco area - and still

others may turn out to be impractical after more detailed investigation or attempts at implementation have been made.

Special emphasis in this study is centered on prepayment of fares. It is axiomatic that, as the complexity of a tariff structure increases, so does the difficulty of collecting individual fares on surface transit vehicles and at rail station fare gates. One solution to this problem is to convert to "self-service" fare collection, involving installation of ticket vending machines at major surface transit stops and terminals, time-stamping machines at vehicle doors, and the employment of roving inspectors to check that all passengers carry recently validated transit tickets. The San Francisco Municipal Railway is considering such a system, but it is unlikely that the entire region would adopt it. Therefore, prepayment offers the optimum way of reducing on-board fare transactions in the short run, and becomes a major — even essential — part of a total joint-fare program.

Prepayment also has other advantages for the industry and the passenger. Operators may improve their cash flow position and reduce their cash handling costs and the work and cost associated with issuing and receiving transfers. The quantity of cash handled in fareboxes and subsequent processing is reduced, as is possible loss of revenue through theft or fraud. Passengers need not be concerned with having the correct change on each trip and, if passes are used, will think of the marginal cost of a trip as small or nil, rather as motorists consider the marginal cost of short automobile trips.

In subsequent chapters, the setting and the market for intersystem trips in the San Francisco Bay Area are described, a general plan for regionwide intersystem transit fares is developed, and a set of phases for implementation is suggested. Finally, some comments are made on monitoring the performance of the implemented scheme, both for the benefit of regional operators and planners, and for those in other regions who may wish to benefit from the experiences of such a project.



## II. THE SETTING

### A. The Metropolitan Region

The term "San Francisco Bay Area" is applied in a variety of ways. In this study, interest is focussed on the six southern counties bordering San Francisco Bay (see Figure 1), which comprise the San Francisco-Oakland and the San Jose Standard Metropolitan Statistical Areas, and a portion of Sonoma County to the northwest. The remainder of this county and the counties of Napa and Solano are also under the jurisdiction of the Metropolitan Transportation Commission (described below), but their transit service — Amtrak, Greyhound, Trailways, and Santa Rosa Municipal Transit excluded — is not contiguous to that of the rest of the metropolitan area and, therefore, not directly relevant to the problem at hand.

Within this study area reside approximately 4,300,000 urban dwellers served by seven major transit systems. The San Francisco Bay Area is somewhat unusual in this respect. In most metropolitan areas, one or two major transit systems dominate, with perhaps smaller systems on the periphery. In the Bay Area, five systems provide the basic local service in five distinct territories; four of them interface in San Francisco. Two rail systems are superimposed on these. As the data in Table 1 show, the systems vary in the number of passengers carried, area served, and population served, but none of them can offer regionwide service. As a result, transit trips which require the use of two or more systems are a major factor in the regional transit riding pattern.

The seven systems are briefly described here — first the five basic ones and then the two superimposed rail systems. Three new peripheral transit authorities in Contra Costa County and an area of eastern Alameda County presently served by BART Express buses are candidates for joint-fare schemes in the early stages, and are therefore also included.

All transit systems described — in fact, all California publicly-owned systems — are eligible to receive federal operating subsidies and California Transportation Development Act (TDA)\* funds for both capital and operating cost subsidies. These funds are allocated through the Metropolitan Transportation Commission.

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\*For a complete list of acronyms used in this report, see Appendix A.

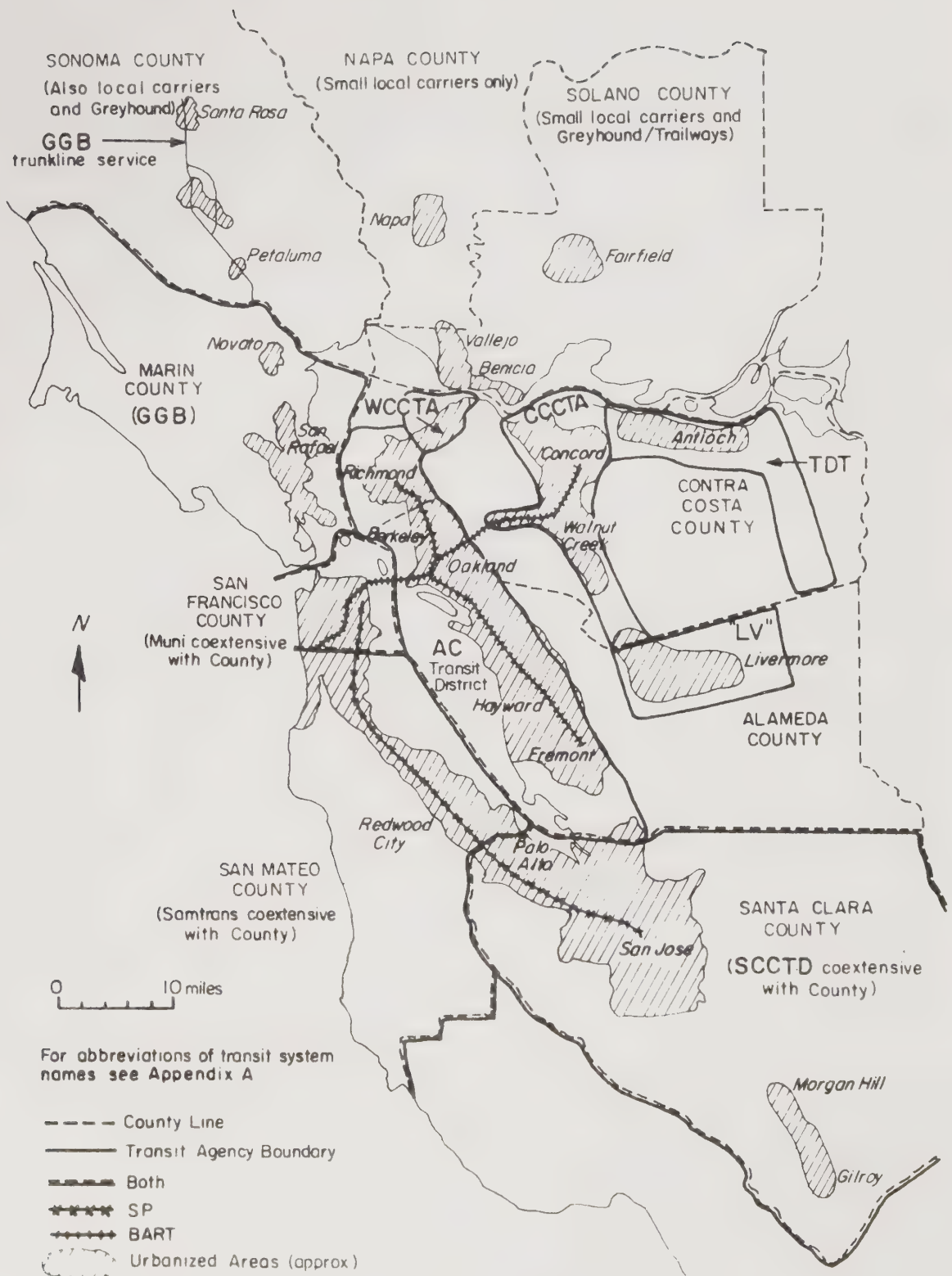


Figure 1 - Major Transit Systems in the San Francisco Bay Area.

TABLE 1 — MAJOR TRANSIT SYSTEMS IN THE SAN FRANCISCO BAY AREA

System	Population Served		Urbanized Area Served		Annual Revenue Passengers	
	Thousands	% of Total	Sq.Mi.	% of Total	Thousands	% of Total
<u>Five "basic" systems</u>						
AC Transit - Service Districts 1 and 2	1,100#	26#	220#	17#	60,000	20
Golden Gate Transit	400#	9#	460#	35#	11,500	4
Municipal Railway	650	15	45	3	130,000	43
San Mateo County Transit ("Samtrans")	500#	12#	150#	11#	17,500	6
Santa Clara County Transit District	1,200	28	250	19	24,000	8
<u>Two regional rail systems</u>						
BART	(2,500)*	(58)*	(500)*	(38)*	45,000	15
Southern Pacific	(1,000)*	(23)*	(250)*	(19)*	6,000	2
<u>Four peripheral areas §</u>						
Central Contra Costa Transit Authority	250	6	120	9	2,000	1
TriDelta Transit	85	2	35	3	500	†
West Contra Costa Transit Authority	35	1	15	1	200	†
Livermore Valley	100	2	35	3	500	†
Totals (rounded)	4,300	100	1,330	100	300,000	100

\* - These numbers (which are excluded from the totals since service areas overlap with other systems shown) are very rough approximations of the populations and areas which have feasible access by feeder auto, bus, walk, or other means to the rail system.

# - Excludes population and area of San Francisco, to/from which services is provided, but within which this system does not serve local trips.

† - Less than 0.5%. § - Including BART express buses in these areas.

Data sources: Information from planning staffs of transit agencies; latest population estimates of California Department of Finance; Caltrans Road System maps showing limits of urbanized areas.

NOTE: This table excludes Napa and Solano Counties, all of Sonoma County except for the Golden Gate Transit Service, and all small and paratransit operations.



AC, BART and Muni also receive operating subsidies from a special one-half percent sales tax in Alameda, Contra Costa, and San Francisco counties ("AB 1107" program); BART is entitled to 75 percent of these funds outright, while the remainder is divided at the discretion of MTC. Finally, the same three systems receive some subsidies from toll bridge revenues for capital expenditures related to transbay service.

## B. The Transit Systems

1. Alameda-Contra Costa Transit District. This was the first multi-county transit district to be established in California. It took over the operations of Key System Transit Lines in 1960 in what is now called Service District No. 1, extending from the north limits of Richmond to the south limits of Hayward. In 1974, the cities of Fremont and Newark voted to annex to AC Transit, and are designated Service District No. 2. The two service districts are separated by Union City (pop. 36,000, area 15 sq. mi.), which voted down the annexation proposal, and now operates a modest minibus service of its own.

AC Transit offers local and express service in the area described above and across the San Francisco-Oakland Bay Bridge to the Transbay Terminal at the edge of the San Francisco central business district. AC Transit has direct property taxing powers; however, the productivity of this tax has been reduced drastically by Proposition 13 of 1978. As mentioned above, it is eligible to receive subsidies from the AB 1107 program and from bridge toll revenues. AC Transit is governed by a board of directors, five of whom are elected by wards and two at large.

Under various contracts AC Transit operates "BART Express" buses in Alameda and Contra Costa counties and local services for the three Contra Costa transit authorities. Contracts are written to reimburse AC Transit for full cost of operating the services; resources used are local TDA funds in most cases. Residents in areas served by these contracts do not have the franchise to vote for AC directors, but neither are they subject to AC's property tax levy.

2. Golden Gate Transit. This service, which includes bus routes and two ferry lines, is operated by the Golden Gate Bridge, Highway, and Transportation District, which is also responsible for the Golden Gate Bridge and its approach highways. The District comprises San Francisco, Marin, Sonoma,

most of Napa, Del Norte, and a part of Mendocino counties, but transit service is operated only in the first three of these. Trunk line inter-county service between San Francisco and cities as far north as Santa Rosa is the District's direct responsibility. Under contract with the non-operating Marin County Transit District it also furnishes additional local services in that county. In effect, therefore, all transit service in Marin is unified under the Golden Gate banner. In Sonoma County, however, municipal services operate in Santa Rosa as well as in outlying cities which are not on the Golden Gate transit network.

The District has no taxing power. As a matter of policy it has used excess toll revenues to subsidize bus and ferry operating costs, setting tolls sufficiently high to enable it to do so. (The District also operates club buses and van pools.) It is governed by a board of 19 directors, nine of whom represent San Francisco and the other ten the counties to the north. The directors are appointed by their respective county boards of supervisors or, in the case of one of San Francisco's representatives, by the mayor of that city.

3. Municipal Railway of San Francisco. The "Muni" is the oldest publicly owned transit system in the United States, having been created in 1912 to build the Twin Peaks and Sunset streetcar tunnels and to compete against the then existing private companies. It now operates all local service within San Francisco (the BART route excepted) and in a very small, but densely populated section of Daly City in northern San Mateo County.

Technically, the Muni is governed by the San Francisco Public Utilities Commission (not to be confused with the California Public Utilities Commission). The commissioners are appointed by the Mayor of San Francisco. The Board of Supervisors retains certain powers, such as adopting the budget and approving fare changes set by the SFPUC. Traditionally, general funds from the city budget have contributed a major share of Muni's operating budget; however, since the passage of Proposition 13 this support has diminished. The Muni is one of the three agencies receiving special subsidy funds from the one-half percent sales tax and from bridge tolls.

4. San Mateo County Transit District. "Samtrans" was created to take over a mixture of previously existing services, including some trunk lines

operated by Greyhound and local services of several cities. It has expanded this network and the quantity of service considerably.

Samtrans' board of directors is the Board of Supervisors of the county. The District does not have taxing powers and has not received general county funds for its support. Neither does it have access to special sales tax or toll bridge funds. Of the seven major systems it is therefore the only one entirely dependent on TDA and UMTA Section 5 subsidies. However, Samtrans is by far the major claimant of TDA funds in the county.

5. Santa Clara County Transit District. Santa Clara County Transit's history parallels that of Samtrans, but it predates the latter by several years. It took over municipal operations in San Jose and Palo Alto, as well as some Greyhound commute services. While the District has very limited property taxing powers, it is the beneficiary of a special one-half percent sales tax enacted by the county. It also receives the major share of county TDA funds. These sources provide it with generous subsidy support and the ability to undertake a major expansion program. The present network is many times larger than that of its predecessors and is still growing. Its routes connect with AC Transit and BART in Fremont and with Samtrans in the Palo Alto/Menlo Park area.

The Board of Supervisors of Santa Clara County also acts as the Board of Directors of the transit district.

6. BART. The Bay Area Rapid Transit District was created in 1957 as a successor to a rapid transit commission to construct and operate a rail system in Alameda, Contra Costa and San Francisco counties. Originally three other counties were also to be part of the district, but these withdrew prior to 1962 when voters approved the bond issues for the network which has since been built.

BART is superimposed on the preexisting surface transit networks of AC Transit and the Muni. The route from Orinda to Concord is outside the territory of AC Transit; this corridor was served by a heavily patronized Greyhound bus route, a vestige of which remains until BART can increase its capacity to handle all transit commuters in this corridor.

The BART district covers all three of the counties mentioned, but the routes do not serve large portions of Contra Costa County or the Livermore Valley area of Alameda County. In response to political pressures, BART



contracted with AC Transit to operate five "BART Express" bus lines in these areas. As described in sections 8 and 9 below, these sometimes complement, sometimes overlap with services which have sprung up in recent years in these areas.

For engineering and land availability reasons, the Westbay BART route terminates just inside San Mateo County in Daly City. San Mateo County, however, does not contribute to BART financing (except for a minor allocation of TDA funds) and is not represented on BART's Board of Directors. In fact, BART's fare schedule includes a surcharge for trips to and from Daly City, which is stated to be in lieu of the kind of financial support which San Mateo County should have contributed to the construction of the system.

BART has the power to tax real property to pay the principal and interest on its capital debt. Since such tax objectives were excluded from the provision of Proposition 13, BART has not had to find new revenue sources for this purpose. BART can also levy a small property tax for general administrative costs, but this has suffered from the effects of Proposition 13. As stated earlier, BART does receive proceeds from AB 1107 and from bridge tolls.

The BART Board of Directors consists of nine members, all elected from wards of roughly equal population in its three counties.

7. Southern Pacific. The Southern Pacific Railroad has operated a commuter service between San Francisco and San Jose for many years. During most of this time, its schedules and fares have been controlled by the California Public Utilities Commission. Starting July 1, 1980, the California Department of Transportation (Caltrans) assumed certain responsibilities under a contract which also includes San Francisco, San Mateo, and Santa Clara counties. SP now essentially operates the service for Caltrans and the counties, who will jointly establish the schedules and fares, subject to approval from the CPUC. However, it is not yet clear how decisions will be reached, and to what extent the Southern Pacific Company or the operating personnel through their unions can modify whatever decisions are reached. Caltrans' role is that of an expeditor and financial contributor, not an operator.
8. The Contra Costa Transit Authorities. Only a small, fairly densely populated area of western Contra Costa County, primarily the cities of

Richmond and El Cerrito, is included in the AC Transit District. In the remaining urbanized areas of the county three new authorities were created in the late 1970s. All are "Joint Powers Agreement" agencies under the laws of California. All are designed to provide for unmet transit needs in areas where there was — or still is — a combination of BART Express bus routes, local contract or direct municipal operation (the latter for example, in Walnut Creek), and unserved urbanized areas.

The preexisting BART Express buses were established as extensions of the rail network into outlying areas which pay taxes to BART but are far removed from a BART station. They are financed by a combination of BART general funds and TDA grants. Recently, some route changes have been made at the request of one of the local transit authorities which was also prepared to provide the funds for the increased operating costs incurred.

These authorities, as all Joint Powers Agreement agencies, do not have taxing powers.

- a. The Central Contra Costa Transit Authority. This, the youngest transit agency covered by this report, was created in 1979 to consolidate and expand transit services in the region between the Berkeley Hills and the Mount Diablo Range. As of September 1980, CCCTA operates no service, but has taken over the contracts under which AC provides service in Concord, Lafayette-Moraga-Orinda, Pleasant Hill, and Martinez. Two of BART's five express bus routes provide trunk line service through the CCCTA territory; one of these interfaces with the Livermore Valley services. Whether these routes will, or should, be absorbed by CCCTA (and whether similar consolidations should occur in the other county authorities' areas) is yet to be decided.

CCCTA is governed by a nine-person directorate, consisting of one member of the County Board of Supervisors and eight representatives of the cities within the district. It will have considerable TDA and UMTA Section 5 funds at its disposal to carry out its program.

- b. East Contra Costa Transit Authority. TriDelta Transit, the "trade name" under which this authority conducts its business, covers the north-eastern portion of Contra Costa County, including three cities and unincorporated residential, industrial, and agricultural lands. One BART express bus route provides the trunk line service through

this territory to/from the Concord station. TDT has contracted with AC Transit for three local routes. TDT also operates dial-a-ride service, owning the vehicles, contracting for their maintenance with the city of Antioch and for their operations with a private management firm. Dispatching is done by TDT staff.

TriDelta Transit uses both TDA and UMTA Section 5 assistance to subsidize these operations. It is governed by a nine-member board of directors; two each are appointed by the cities of Pittsburg, Antioch, and Brentwood, and by the County Board of Supervisors; the ninth is appointed by the other eight to represent senior citizens. In general, the city appointees have been members of their respective city councils, the others nonelected citizens.

- c. Western Contra Costa County Transit Authority. This Authority fills the gap to the north of AC Transit territory in the northwestern corner of the county, including two cities and considerable unincorporated stretches of urban and still-rural land. WCCTA concentrates primarily on paratransit services. It owns its vehicles and a maintenance facility, which was constructed on land belonging to the city of Hercules. A private management firm performs all operating functions — dispatching, running, and maintaining the vehicles. One BART express route operates from El Cerrito Del Norte station into the southern part of the WCCTA area as far as Pinole; discussions were under way in August 1980 to extend this line to Crockett at the northern end of WCCTA's area, replacing an extension of an AC Transit local line which presently offers weekday service on that route under contract.

WCCTA relies almost entirely on TDA funds for its subsidies; it has refused the opportunity to accept UMTA Section 5 funds in order to avoid being subjected to federal requirements which accompany such allocations. WCCTA is governed by a board of seven directors, of whom three are appointed by the County Board of Supervisors to represent unincorporated areas, and two each by the city councils of Hercules and Pinole.

- 9. Livermore Valley. No transit district has been created or extended to cover the Livermore Valley in eastern Alameda County. Trunk line service



in the Livermore Valley is provided by a BART express bus route to/from Hayward and Bay Fair stations. The city of Livermore also contracts with a private bus company to operate a local fixed route service in the eastern end of the valley. In this project, the valley is treated as a "zone" which could become a separate "authority", be annexed to an existing agency, or remain as it is now.

### C. Current Fare Structures and Transfer Arrangements

Since this project concerns itself with the problem of fares for inter-system transit passengers, the existing fare structure and transfer arrangements must be set forth. The levels of fares are of secondary interest and, to keep the tabulations simple, are not included here. In any case, they are changed at rather frequent intervals. Even the fare structures and the transfer arrangements are modified occasionally. Tables 2 and 3 show the status as of September 1, 1980.

It will be noted that there are varying approaches to fare structures and prepayment schemes. Of the seven major systems two have universal fares; in the case of the Muni, the relatively small territory served and the need to maximize boarding speeds makes this an obviously optimum policy. The universal fare in Santa Clara County, with an opportunity to take north-south trips of about 45 miles, is one of the best transportation bargains in California.\* Three systems use zone fares for most or all passengers, while another (AC Transit) does so for transbay and express trips, but has a universal fare for Eastbay local trips. BART has a station-to-station fare matrix which varies with distance for trips over 6 miles long, with some deviations from this formula to promote traffic in outlying areas.

All of the seven major systems offer some form of prepayment opportunity. However, BART and Samtrans do this only for the convenience of passengers and do not allow discounts. Four of the remaining systems offer discounted multi-ride tickets (the Muni is the exception) and four offer monthly passes (Golden Gate Transit is excluded in this instance).

Intersystem transfer arrangements vary unpredictably (Table 3). They have developed in an ad hoc fashion and often are structured according to

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\*This bargain is even greater when the trip is extended via a free transfer to/from AC Transit or Samtrans.

TABLE 2 ADULT FARE STRUCTURE IN BAY AREA TRANSIT SYSTEMS  
As of September 1, 1980

System	Single Fares	Forms of Prepayment Available	
		Type	Price Basis
AC Transit - Transbay Eastbay	Zoned (3 Eastbay zones). Zoned for express routes (3 zones). Universal fare for local routes.	20-ride ticket Monthly pass	5% discount 36 cash fares
Golden Gate Transit	Zoned (5 Northbay zones) for buses. Higher fares on ferries. <sup>1</sup>	20-ride ticket Weekly pass on ferries	10% discount See NOTE 1
Municipal Railway	Universal fare.	Monthly pass	32 cash fares
Samtrans	Zoned (4 zones south of San Francisco)	40-ride ticket	No discount (convenience only)
Santa Clara	Universal fare; higher for express routes.	Monthly pass-local routes Monthly pass-all routes 22 local-ride ticket 40 express-ride ticket	34.3 local cash fares 33.3 express cash fares 9% discount 16.7% discount
BART	Related to distance traveled with some modifications in formula.	Stored fare ticket	No discount (convenience only)
Southern Pacific	Zones (6 zones south of San Francisco)	Monthly "Every Day" pass Monthly "Weekdays" pass Seven-Day pass 20-ride "Family" ticket	20.6-25.2 cash fares <sup>2</sup> 18.8-23.3 cash fares <sup>2</sup> 5.5-6.9 cash fares <sup>2</sup> 13.8-16.8 cash fares <sup>2</sup>
Contra Costa County Authorities	Universal fare within each authority or contract area.	None	
BART Express Buses	Zoned (maximum 2 zones per route).	None	

NOTES: 1 - Sausalito Ferry - cash fare always higher than comparable bus fare. 20-ride ticket sold at 10% discount from comparable *bus* fares; weekly pass priced at 5 cash fares.  
Larkspur ferry - cash fare same as comparable bus fare weekdays, higher on weekends. 20-ride ticket sold at 10% discount from weekday fare; weekly pass priced at 6.7 weekday cash fares.

2 - Ranges shown are for travel to/from San Francisco; prices of a few passes between suburban zones fall outside these ranges.

TABLE 3 - PRESENT TRANSFER ARRANGEMENTS  
(As of September 1, 1980)

From \ To	AC	Golden Gate	Muni	Sam-trans	Santa Clara	BART	SP	BART Buses	CCCTA <sup>1</sup>	TDT	WCCTA
AC	x	None	None	None	Free	None	x	None	x	x	Free
Golden Gate	None	x	None <sup>2</sup>	None	x	None	x	x	x	x	x
Muni	None	None <sup>2</sup>	x	None	x	Half fare on Muni	None	x	x	x	x
Sam-trans	None	None	None	x	Free	None	Free on Sam-trans <sup>5</sup>	x	x	x	x
Santa Clara	Free <sup>3</sup>	x	x	Free <sup>4</sup>	x	None	Free <sup>8</sup>	x	x	x	x
BART	Free <sup>3</sup>	None	Half fare	None	Free	x	x	Free <sup>4</sup>	Free	x	x
SP	x	x	None	Free <sup>5</sup>	Free <sup>7</sup>	x	x	x	x	x	x
BART Buses	Free <sup>3</sup>	x	x	x	x	None	x	x	Free	Free	Free
CCCTA <sup>1</sup>	x	x	x	x	x	None	x	Free <sup>4</sup>	Free <sup>6</sup>	x	x
TDT	x	x	x	x	x	x	x	Free <sup>4</sup>	x	x	x
WCCTA	Free <sup>3</sup>	x	x	x	x	x	x	Free	x	x	x

NOTES: None - No arrangement; passengers pay two regular fares.

x - Intrasystem, or no direct interface.

1 - Refers to current contract services in CCCTA territory.

2 - Except 50c reduction in fares when transferring to/from ferries.

3 - For trips within the Eastbay only.

4 - For first zone of connecting system only.

5 - If SP rail ticket is shown.

6 - Between Concord and Pleasant Hill contract routes.

7 - Intra-county SP trips only, except at two stations where all SP trips are accepted.

8 - Intra-county SP trips only.



pragmatic, rather than marketing or equity reasons. At one end of the spectrum, Golden Gate accepts no transfers from other systems for policy reasons, and BART does not for technological ones. At the other extreme, Santa Clara Transit has agreed to accept transfers from three of the four systems with which it interfaces, and under certain circumstances from the fourth (SP). Usually, the passenger pays no fare on the second system involved in a journey, but in approaching BART from Muni or the SP from Samtrans, the discount applies on the first system used.

#### D. Regional Transit Coordination

Regional transit coordination takes place in two forms: supervision of transit systems by the regional transportation planning agency, and direct cooperation of the transit managements.

1. Metropolitan Transportation Commission. The MTC is the regional agency responsible for transportation planning in the nine counties which abut on San Francisco Bay. It has special powers and obligations under various state statutes which provide for subsidizing transit systems; one of its charges is to assure cooperation among transit systems, including fare coordination.

The Commission consists of 18 members, nine representing the counties, five selected by the cities within the five largest counties, two appointed by other regional agencies, and two non-voting members representing the California and U.S. Departments of Transportation.

2. The Regional Transit Association. In 1977 the general managers of the five "basic" transit systems and of BART formed the RTA under a Joint Powers Agreement. RTA's purpose is to undertake joint projects which will promote coordination. For example, joint purchasing of some materials and supplies, and a regional identification card for handicapped passengers are products of the RTA. RTA has formed committees consisting of appropriate staff members from the transit agencies. One of these, the Services and Tariffs Committee, deals with problems of inter-system transfers, and has guided this project on joint fares.

RTA has no offices, staff, or other tangible resources. MTC provides staff support as needed.

3. The Transit Operators' Coordinating Council. The same six general managers of the RTA plus the Executive Director of MTC comprise the TOCC,

which was created originally to meet coordination requirements included in the AB 1107 legislation for AC, BART, and Muni, and then broadened to include the other RTA operators. TOCC concentrates on policy matters, including discussion of pending legislation, and on matters of direct concern to MTC as the regional grant-approving agency. MTC also provides staff support to TOCC.

TOCC differs from the RTA in that its mission is specifically related to the mandate of MTC. The objectives of the Council are:

- To assist the MTC in meeting state and federal requirements.
- To focus attention and advise MTC on needed transit coordination improvements.
- To encourage participation of the operators' top management in MTC's deliberations concerning public transit policy.\*

The Executive Director of MTC has a vote on the TOCC, but not on the RTA. There is, however, considerable overlap between the two and, on some occasions, meetings of one have been scheduled to follow immediately upon the close of a meeting of the other.

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\*Metropolitan Transportation Commission. Regional Transportation Plan. Berkeley, CA: Annually updated document. (Quoted from 1980 revisions.)

### III. THE MARKET

In order to estimate the market for intersystem joint fares, data on the most recent available passenger trip interchanges between interfacing systems were collected and analyzed. For some interfaces, passenger surveys of both systems involved were available, but the numbers of trips reported as transferring did not necessarily agree. For other interfaces no data were available; as a part of this study a survey of transfers between Samtrans on the one hand and AC Transit and the Muni on the other was conducted (footnote e in Table 4), and estimates for transfers involving the Contra Costa County authorities and the Livermore Valley were made from available traffic data (footnote i).

Table 4 shows the results of this compilation for all weekday trips. Of the order of 100,000 daily intersystem transfers seem to be made in the study area. Assuming that the 300 million annual revenue passengers reported in Table 1 represent about one million passengers per weekday, about 10 percent of all passengers used more than one system for a complete transit trip. It must be remembered, however, that these are only approximate numbers. Not only are all underlying data approximated, but double-counting of intersystem passengers in cases where both systems involved will consider them as originating revenue passengers has not been corrected for. There is also no adjustment for three-system trips.

Since, as will be explained later, the principal emphasis of the early stages of any joint fare plan is on monthly passes for commuters, Table 5 has been constructed to list only work trips interchanging between systems. For subsequent market calculations this table has been further refined by adjudicating differences between reported numbers which do not agree, and by assuming symmetry because current inequities (such as the arrangement under which transfers from AC to BART are not discounted but those in the opposite direction are free) would presumably disappear in a well-designed regional joint-fare scheme. The results of these steps are shown in Table 6. The multisystem work trip market, then, is of the order of 30,000 commuters (60,000 weekday trips in the complete matrix). Table 6 also shows that all large numbers involve BART, the Muni, AC Transit, and SP, and that only six of the 25 cells of possible interfaces contain numbers of or exceeding 1,000 commuters.



TABLE 4 -- IDENTIFIED MARKET OF INTERSYSTEM TRAVEL  
ALL TRIPS -- WEEKDAYS

To From	AC	Golden Gate	Muni	Sam-trans	Santa Clara	BART	SP	CCCTA	TDT	WCCTA	LV
AC	x	120 <sup>c</sup> 290 <sup>d</sup>	5,300 <sup>c</sup> 6,900 <sup>b</sup>	60- 250 <sup>e</sup>	≈45 <sup>g</sup>	11,200 <sup>c</sup> 14,300 <sup>a</sup>	x	x	x	≈150 <sup>i</sup>	≈100 <sup>i</sup>
Golden Gate	120 <sup>c</sup> 290 <sup>d</sup>	x	≈1,600 <sup>d</sup>	≈30 <sup>d</sup>	x	≈30 <sup>d</sup>	x	x	x	x	x
Muni	3,900 <sup>c</sup> 6,900 <sup>b</sup>	≈1,600 <sup>d</sup>	x	470- 840 <sup>e</sup>	x	12,700 <sup>a</sup> 13,000 <sup>b</sup>	4400 <sup>f</sup>	x	x	x	x
Sam-trans	60- 250 <sup>e</sup>	≈30 <sup>d</sup>	470- 840 <sup>e</sup>	x	≈300 <sup>g</sup>	≈3,200 <sup>a</sup>	≈325 <sup>h</sup>	x	x	x	x
Santa Clara	≈45 <sup>g</sup>	x	x	≈300 <sup>g</sup>	x	≈330 <sup>g</sup>	≈500 <sup>g</sup>	x	x	x	x
BART	17,100 <sup>c</sup> 18,300 <sup>a</sup>	≈30 <sup>d</sup>	9,300 <sup>a</sup> 13,800 <sup>b</sup>	≈3200 <sup>a</sup>	≈330 <sup>g</sup>	x	x	1400 <sup>i</sup>	150 <sup>i</sup>	150 <sup>i</sup>	450 <sup>i</sup>
SP	x	x	5,200 <sup>f</sup>	≈325 <sup>h</sup>	≈500 <sup>g</sup>	x	x	x	x	x	x
CCCTA	x	x	x	x	x	1,500 <sup>i</sup>	x	x	≈100 <sup>i</sup>	None at present	≈50 <sup>i</sup>
TDT	x	x	x	x	x	150 <sup>i</sup>	x	≈100 <sup>i</sup>	x	x	x
WCCTA	≈150 <sup>i</sup>	x	x	x	x	150 <sup>i</sup>	x	None at present	x	x	x
LV	≈100 <sup>i</sup>	x	x	x	x	500 <sup>i</sup>	x	≈50 <sup>i</sup>	x	x	x

For source footnotes see p. 20.

TABLE 5 -- IDENTIFIED MARKET OF INTERSYSTEM TRAVEL  
WORK TRIPS

From	AC	Golden Gate	Muni	Sam-trans	Santa Clara	BART	SP	CCCTA	TDT	WCCTA	LV
AC	x	40 <sup>c</sup> 100 <sup>d</sup>	2,800 <sup>c</sup> 3,800 <sup>b</sup>	30 <sup>k</sup> 120 <sup>k</sup>	20 <sup>k</sup>	6,100 <sup>c</sup> 7,900 <sup>a</sup>	x	x	x	≈100 <sup>i</sup>	≈100 <sup>i</sup>
Golden Gate	40 <sup>c</sup> 100 <sup>d</sup>	x	800 <sup>k</sup>	15 <sup>k</sup>	x	15 <sup>k</sup>	x	x	x	x	x
Muni	2,000 <sup>c</sup> 3,400 <sup>b</sup>	800 <sup>k</sup>	x	220 <sup>e</sup> 400 <sup>e</sup>	x	7,900 <sup>a</sup> 8,100 <sup>b</sup>	3,500 <sup>j</sup>	x	x	x	x
Sam-trans	30 <sup>k</sup> 120 <sup>k</sup>	15 <sup>k</sup>	220 <sup>e</sup> 400 <sup>e</sup>	x	150 <sup>k</sup>	2,300 <sup>a</sup>	260 <sup>j</sup>	x	x	x	x
Santa Clara	20 <sup>k</sup>	x	x	150 <sup>k</sup>	x	170 <sup>k</sup>	400 <sup>j</sup>	x	x	x	x
BART	10,200 <sup>c</sup> 10,900 <sup>a</sup>	15 <sup>k</sup>	5,500 <sup>a</sup> 8,100 <sup>b</sup>	2,300 <sup>a</sup>	170 <sup>k</sup>	x	x	1,000 <sup>i</sup>	120 <sup>i</sup>	100 <sup>i</sup>	300 <sup>i</sup>
SP	x	x	4,100 <sup>j</sup>	260 <sup>j</sup>	400 <sup>j</sup>	x	x	x	x	x	x
CCCTA	x	x	x	x	x	1,100 <sup>i</sup>	x	x	≈60 <sup>i</sup>	None at present	≈30 <sup>i</sup>
TDT	x	x	x	x	x	120 <sup>i</sup>	x	≈60 <sup>i</sup>	x	x	x
WCCTA	100 <sup>i</sup>	x	x	x	x	100 <sup>i</sup>	x	None at present	x	x	x
LV	100 <sup>i</sup>	x	x	x	x	300 <sup>i</sup>	x	≈30 <sup>i</sup>	x	x	x

For source footnotes see p. 20.

TABLES 4 AND 5SOURCE FOOTNOES:

- a - BART. 1978 Passenger Profile Survey.
- b - Wilbur Smith & Associates. On-Board Muni Railway Survey, 1975.
- c - Crain & Associates. On-Board AC Transit Survey, 1979.
- d - Golden Gate Transit. On-Board Survey, 1980.
- e - Based on ITS/MTC Samtrans Survey (represents 95% confidence interval), 1980.
- f - From Planning Section, Municipal Railway of San Francisco.
- g - Santa Clara Transit District. Passenger Counts and Planning Estimates.
- h - Caltrans. Survey of SP Passengers, 1978.
- i - Estimated by ITS from source a. above, plus AC Transit patronage data for routes involved.
- j - Assumed 80 percent of total daily trips (from Table 4).
- k - Assumed 50 percent of total daily trips (from Table 4).



TABLE 6 -- ASSUMED INTERSYSTEM WORK TRAVEL MARKET  
FOR PASS SALES PENETRATION CALCULATIONS

To From	AC	Golden Gate	Muni	Sam- trans	Santa Clara	BART	SP	CCCTA	TDT	WCCTA	LV
AC		100	3,000	75	20	WB-3,500 EB-7,000	x	x	x	100	100
Golden Gate			800	15	x	WB-5 EB-10	x	x	x	x	x
Muni				300	x	WB-4,000 EB-4,000	3,500	x	x	x	x
Sam- trans					150	WB-2,000 EB-300	250	x	x	x	x
Santa Clara						x	400	x	x	x	x
BART							x	WB-350 EB-650	WB-40 EB-80	WB-35 EB-65	WB-100 EB-200
SP								x	x	x	x
CCCTA									60	x	30
TDT										x	x
WCCTA											x
LV											

ONLY ONE  
DIRECTION IS  
ESTIMATED --  
OTHER DIRECTION  
REPRESENTS RETURN  
TRIPS OF SAME COMMUTERS.

WB = BART trip origin/destination in West Bay  
EB = BART trip origin/destination in East Bay

#### IV. THE ISSUES

The issues and options which arise when a range of possibilities for joint-fare program implementation is considered are presented here. They are divided into categories with an aim of guiding the reader toward an understanding of the range of mixes possible within a program. This chapter emphasizes prepaid fares, which are likely to be the first and simplest stage of a complete joint-fare program. The issues relating to single-ride fares are often similar.

##### A. Scope of a Joint-Fare Prepayment Project

###### 1. Type of Fare Instrument

Several options exist for the adoption of a type of instrument for prepayment. The most significant of these can be grouped into four categories. These are:

- the monthly pass, or, a variant of this, the weekly pass;
- the multiride ticket book with, say, 40 tickets;
- the daily pass, and
- the weekend region-wide excursion pass.

###### a. The Monthly or Weekly Pass

This type of fare instrument consists of a pass in the form of a ticket or card, laminated or otherwise, specifying the system or systems on which the pass is valid. It also indicates the month during which the pass is valid, and might incorporate a photo or other means of identification which would tie it to its legitimate user.

On surface systems, the monthly pass is designed in such a way that bus drivers and other pertinent operations personnel, such as inspectors, can easily identify the card as a valid pass. The primary distinguishing feature of the monthly pass is that it permits the passenger unlimited rides on the participating system(s) during the month that it is valid, and its price is based upon the normal or average number of commute rides the passenger is likely to take.

Some operators, four of them in the San Francisco Bay Area, already utilize monthly passes that conform to the definition given

above. The option exists for these systems to continue with their pass programs as these presently exist. The other alternative is for certain or all of these operators to integrate their intra-system pass programs in various ways so that monthly passes are accepted by more than one system. One purchase for the passenger entitles him or her to ride on multiple systems.

The weekly pass has the same generic qualities as the monthly pass. As an option, the weekly pass presents some different problems from the monthly pass, primarily because of the considerably greater frequency of its marketing and sale, and the administrative tasks involved.

b. The Multiride Ticket Book

This type of fare prepayment is not a pass in that purchasers are not entitled to unlimited rides, but are only permitted as many rides as there are tickets in the book. Passengers buy the book with the designated number of tickets and surrender a ticket each time they board a vehicle of the system on which the book is valid. When the tickets have been exhausted, passengers can retain the book itself as evidence to claim transportation costs for federal or state tax purposes.

Unlike the monthly pass, the multiride book does not offer the advantage of unlimited rides at a set price, but is primarily a method of making fare paying and collecting more convenient. Operators adopting this strategy of prepayment often offer a discount for buyers as a marketing incentive.

c. Daily Pass

Unlike either of the two options previously discussed, the daily pass would often be sold on board a system vehicle. This would be particularly likely in the case of participating surface systems, since buses stop at many locations where there may not be a convenient or safe location for selling passes off the vehicle. Under a prepayment system utilizing a daily pass, passengers must determine:

- to which systems they want access at the prepaid price, and
- the geographic area in which they wish to ride.



Once this has been determined, the bus driver or other operations official determines the price of the pass and releases to the passenger a ticket or strip of tape indicating the date, time of day, and distance of travel permitted, as well as the systems the passenger may use. The ticket or tape might incorporate various markings indicating type of validation, among which might be punched holes in the appropriate locations on the ticket or tape.

Daily passes of one system would have to be counted whenever presented to the vehicle operator or station attendant of another system. Only in this manner could reimbursement for multisystem usage be easily accounted for and the appropriate payment of funds, whether by subsidy or straight transfer, occur.

d. Week-end Region-wide Excursion Pass

This type of prepayment is unique from the others discussed in that it is exclusively designed for travel during off-peak hours (on the weekend) and thereby is not a pass for commuters. Its sale could be either on or off vehicle, and would entail passengers paying a set fee, with the understanding that they could ride any vehicle on any participating system an unlimited number of times within a specified period of time (say 48 hours). Each time a passenger with an excursion pass uses a different transit system, the vehicle operator or station agent might have to count the trip for purposes of revenue redistribution. However, in the case of the excursion pass, operators may wish to forego this and set up a revenue redistribution formula based on probable usage.

2. Eligible Users and Restrictions

Two questions arise when dealing with the options available for the eligibility of prepaid fare transit users.

- Who is and who is not specifically entitled to the benefits of certain types of prepaid fare? This is a clearcut problem of restriction to certain groups.
- What is the appeal and design intent of certain types of prepayment?

Certain conditions may exist where anyone is permitted the privilege of purchasing and using a particular prepayment system, but the benefits

of such a system may be minimal or nonexistent for some groups of individuals. In such a case, the options become enmeshed in issues of marketing rather than pure eligibility. These options are discussed more fully in Section A.8. of this chapter. Suffice it to say at this point, however, that prepayment instruments such as the monthly pass and the weekly or monthly multiride book are options which, by design, are intended to appeal to the regular commuter rather than the occasional transit traveler.

There are variations, even of the monthly pass, which make it necessary to consider a number of options concerning restrictions on the eligibility of certain classes of transit riders. These options are primarily concerned with the creation of prepaid fare types for groups of people such as the handicapped, the elderly, and youth. Within this category, three sets of options exist.

#### OPTION A1

A system of prepayment could be created to include only these groups or a subset of these groups. For instance, a monthly joint pass program could be initiated for senior citizens, or for the other two groups, or a subset of these groups. This might be the extent of a joint-fare prepayment project.

#### OPTION A2

Such a pass for the above named groups might be initiated in addition to a monthly pass for all other users, such as regular commuters. Presumably, the pricing of the two passes would be different; otherwise, there is no rationale for two passes.

#### OPTION A3

No special prepayment instrument for groups such as seniors, the handicapped, and youth might be offered.

If a special 'pass' or other type of prepayment is considered for special minority groups, then options of restricting the time of validation for these passes might be taken.

OPTION B1

Individuals holding special discount passes not designed for commuters might be prohibited from using the passes during commute hours, such as 6 to 9 a.m. and 3 to 6 p.m., Monday through Friday, excepting holidays.

OPTION B2

Option B2 could be extended to include any kind of prepayment system for all passengers. Depending upon the type of prepayment and the discount (if any) involved, this option would probably only make sense on economic grounds. More on this later.

OPTION B3

As a corollary to this last set of issues, a further option exists; that of creating a special off-peak pass that would encourage ridership during the 'slow' hours and offer a discount (or further discount, as the case may be) as a purchasing incentive.

3. Geographic Scope

The issues involved in the considerations of options for the geographic scope of a prepayment system are many and complex. At this point we will merely lay out the skeleton of five possibilities. The intricacies involved with the choice of these options are discussed in detail later.

OPTION A

Concentrate on the most heavily populated urban part of the central San Francisco Bay Area, i.e., San Francisco, Oakland and Berkeley. An interurban rail line, BART, serves the entire area, and a major bus line serves each side of the Bay; the latter two operators already have intrasystem passes.

OPTION B

Initiate a joint prepayment program only among those operators who already have an intrasystem method of prepayment.

OPTION C

Establish a two-pronged system of prepayment revolving around the two interurban rail systems, BART from the East Bay to San Francisco, and Southern Pacific along the Peninsula corridor from San Jose to San Francisco. Muni could be a participant in both schemes, while



Samtrans and Santa Clara County Transit District would join with SP-Caltrans in one prepayment scheme; AC and the smaller operators in Contra Costa County would participate with BART in a separate prepayment scheme.

#### OPTION D

The participation of all seven major operators in a joint prepayment scheme would be a choice under this possibility. Each system could market its own pass, with endorsements by the other operators, according to the distance for which the rider wants to purchase the prepaid fare.

#### OPTION E

This is an extension of Option D. Under this possibility, the entire region would be rezoned and passengers would pay an amount for the prepaid fare according to the distance traveled, or how many zones are encompassed. This option requires a central revenue redistributing, accounting, and marketing body or agency, and is the most inclusive and complex of the option possibilities.

### 4. Types of Fare Paying Methods

The list of passenger fare paying methods can be divided into two basic types, manual and automated. These types are not mutually exclusive, and various combinations of manual and automated fare paying methods can occur together.

#### a. Manual Systems of Payment

- (1) On Board Surface Vehicles. Passengers pay their fares while boarding a bus or other transit vehicle. Payment is made in cash into a farebox; the driver checks that the payment is correct.
- (2) Station Agents. Payment is made in cash by the passenger to the station agent or other designated official before boarding the rail vehicle.
- (3) Retail Outlets and/or Banks. The passenger pays in advance or by credit card for the prepaid fare at outlets which sell the passes or tickets for the transit operators.

b. Automated Systems of Payment

- (1) On Board Surface Vehicles. Passengers pay their fares while boarding a bus or other transit vehicle. Unlike manual systems, payment is made through an automatic farebox which, either separately or linked to a computer, calculates the appropriate fare for the rider.
- (2) Sidewalk Vendors. Payment is made to an automated fare machine located at major bus stops or stations. When the correct amount has been deposited, the machine discharges the ticket or pass. With the appropriate technology, these machines may have the capacity to make change.
- (3) Station Ticket Vendors. Same as sidewalk vendors, but located in restricted areas within stations or terminals.
- (4) Credit Card Purchase. The passenger contracts for a year or until cancelled to purchase the book of tickets, pass, or other type of prepayment, and is billed monthly through a credit card account.
- (5) Payroll Deduction. The operators work out payroll deduction agreements with certain employers, and the passengers have the appropriate amount, according to the type and extent of the prepayment plan they choose, deducted from their paychecks on a weekly, biweekly, or monthly basis.

5. Pricing and Discounting

The alternatives available to transit operators on the issue of pricing and discounts are innumerable. The various options are best understood in reference to the possible designs or intents of operators on the problem of pricing and discounting. With respect to a joint fare prepayment program, three main policy alternatives are possible to appeal to passengers:

- design a program that primarily suits commuters;
- create a prepayment system that will appeal to the noncommuting market, possibly concentrating on the elderly, handicapped, and youth;

- design a program that will not differentiate between different types of users, or else segment it to appeal to commuters and non-commuters alike, perhaps with different 'passes' for special groups.

Depending upon which of these alternatives is selected, three broad pricing alternatives exist:

- Discounts across the board, with no distinction given for day, peak, evening, or weekend usage.
- Allow discounts only during off-peak, non-commute hours.
- Give no discounts at all.

From these very general and broad types of pricing policies, we can now consider some pertinent pricing and discounting options which offer some realistic alternatives for transit operators, particularly in the San Francisco Bay Area.

#### OPTION A

Maintain the standard fare price, with no explicit discount. In the case of a multisystem fare prepayment program, the price would amount to the sum of the cost of paying for rides on each system separately. If the transit systems all have passes or some other form of single or multiple ride prepayment, the price for the new form of prepayment would be the addition of the separate fares. The advantage for the rider would presumably be in the convenience of having to buy and use only one fare and, in the case of a pass, riders would have the privilege of using the systems more times than they had paid for.

#### OPTION B

The prepaid joint fare would cost the sum of individual fares from each system (pass or otherwise) minus some agreed upon discount such as 10% or 20%.

#### OPTION C

The price of the joint prepaid fare would be the regular price of riding the primary system (the system on which passengers begin their trips), but the cost for the privilege of using other systems



which participate in the joint fare scheme would be one-half fare for each additional system. For instance, passengers beginning their trips in the East Bay and using BART or AC Transit, but also Muni in San Francisco, would pay the full BART or AC fare plus one-half of the Muni fare.

#### OPTION D1

Where the primary trunk line, particularly a rail line, parallels a feeder system, especially in a concentrated urban area, the purchase of a prepaid fare for one or the other system entitles the passenger to free ridership on the other system.

#### OPTION D2

Where the conditions as described in Option D1 exist, the purchase of the prepaid fare for the trunk line entitles the passenger to free ridership on the feeder line, but not vice versa.

#### OPTION E

All types of prepaid fares are priced upon zone usage, so that a passenger is not charged on the basis of the number of systems being utilized, but upon which zones are being traversed. This, in effect, establishes a regionwide fare structure.

### 6. Subsidies/Cost Burden

Reimbursement for financial losses caused by the implementation of a joint fare prepayment system constitutes a major worry for all transit operators. Whatever options are chosen, operators will probably desire some flexibility in the design of a subsidy (and for that matter, pricing) scheme in situations of information uncertainty with respect to revenue flows. Five broad options present themselves as reasonable alternatives to be considered.

#### OPTION A

Whatever extra costs are incurred are absorbed by present revenue sources. This option amounts to having no subsidy for a joint prepaid fare program. If a substantially increased market were to occur as a result of such a program, some might view this alternative as viable. Its inherent advantage is that an operator is not accountable to the supplier of the subsidy revenue.

#### OPTION B

Increased costs from a joint prepaid fare project are covered from available revenue of present state subsidy accounts, such as AB1107 or TDA revenues. This money, if available, would take care of revenue shortages resulting from prepaid fare discounts or from extra ridership by passengers taking advantage of the unlimited ride privilege of passes.

#### OPTION C

The extra costs discussed in Option B are paid from other subsidy sources (either new ones or ones not presently being utilized) such as federal UMTA Section 5 grant money.

#### OPTION D

Capital costs related to joint fare prepayment (such as special automatic fare processing machines) are subsidized through the revenue sources described in Option C. This could be in addition to subsidizing operating losses, or by itself.

#### OPTION E

Subsidies are used only for funding administrative costs for implementing the scheme. They would be obtained as described in Options B or C.

Various methods exist for deciding upon the manner in which subsidies should be distributed to transit operators, and they relate in large measure to the type of service being provided. One option is to reimburse on the basis of the number of passengers using a particular system with a type of prepaid fare. Another is to subsidize a system for the number of passenger miles it provided for joint prepaid fare users. Under this option the subsidy formula would be considerably different for, say, BART and Muni. The third option is to subsidize systems for joint prepaid fare participation according to the type of service provided. The subsidy formula would be different for regular urban bus service, express bus service, and rail transit service. Under such a proposal, a subsidy surcharge might be added for express or rail service since, one could argue, the quality of service provided is superior.

## 7. Levels of Technology

Whatever options are selected with respect to the mechanics of a joint-fare prepayment program, technology will become an issue. Even the simplest proposal must deal with technological problems at some level. The level of technology ascends from the relatively simple to the complex as the type of prepayment program being considered progresses from a primarily manually operated system to one increasingly or entirely automated.

Three major areas of concern present themselves when the problem of automation is considered. The methods by which the prepaid fare is processed through transit systems is the first and most important of these. Next as a consideration for research is the process or technology which enables individuals to purchase joint-fare tickets or passes. And finally, as an area of concern is the issue of security as it is related to technology. This, then, is the context in which we briefly discuss some options relating to possible technologies for use in transit prepaid fares.

### a. Fare Processing

#### OPTION A. Visual Fare Instrument

From a technological perspective, the simplest type of prepaid fare is of the visual type, whether it is a pass, a ticket book, or a token. The hallmark of this type of fare is that it is easily identifiable as representing a prepaid fare. Visual fare 'cards' are already in wide use around the country and elsewhere. They are easiest to adapt to surface transit systems which have no automated system of fare processing anyway. On rail systems which utilize automated fare gates, acceptance of this type of prepaid fare requires manual override capability, usually in the form of station agents opening certain gates for passengers with visual passes.

- Where multiple systems endorse a prepaid fare program, the option exists for a section of the visual prepaid fare to be reserved for the decal or stamp of the additional endorsing operator or operators, so that bus drivers and other operations personnel can easily inspect and verify the validity of the fare instrument.



- The visual pass can be laminated, as a further precaution against counterfeiting, and also to extend its durability. Lamination is impractical for the commute book type of prepayment, and probably most other forms with the exception of the monthly pass.
- As a further aid to identification, such visual passes could contain the photograph of the holder. Some European transit systems employ this technique. Again, cost considerations and user convenience are important factors here.

#### OPTION B. Visual Fare Instrument With Magnetic Strip

The visual type of fare instrument just described can be modified to comply with the requirements of systems using automated fare processing equipment, thus eliminating the necessity for assigning individuals the task of checking fares. The visual 'card' may retain its visually identifiable characteristics for use with manual fare processing systems, such as bus lines. However, it may also contain a magnetic strip with encoded information which only the computers of automated systems can and need to interpret. There are only two possible limitations to this type of fare. The first is the type and size of the ticket stock itself. Unless the machinery of the automated equipment is to be substantially altered or replaced, this type of card must be compatible with what is already in use, or else it ceases to be a viable option. Second, the machinery of the 'automated' system must have the capacity to understand the type of fare it is processing. For instance, if the visual 'card' with its magnetic strip is a monthly pass, the fare gate logic must read it as a pass.

#### OPTION C. Variations on a Theme of Magnetic Tickets

Where a joint prepaid fare program is under consideration, as it is in the San Francisco Bay Area, and more than one operator either has in place or is contemplating the installation of automated fare processing equipment, options exist for compatibility.

- All such operators joining in a prepayment program buy the same equipment. Purchase costs might be lower, and the technical questions about fare processing coordination become moot.
- Operators explore the possibilities for adapting present machinery to accept a common type of fare. The fare instrument itself must be designed with these sets of problems in mind.
- Purchase or design an interim technology which allows automated fare processing, for joint prepaid fare, but does not alter the 'in-place' apparatus. The 'edge reader' which is compatible with most automated fare gate systems is one such example of an interim technology. It is one compromise option which avoids the necessity for huge capital outlays in major fare processing equipment.

#### OPTION D. Computer Technology

The most expensive type of fare processing technology that may be considered an option today involves the use of a centrally located, on-line computer to control prepaid fare use. Under such a system, fare gates (certain ones or all of them) are connected to the computer, along with automated, self-service vending machines at which passengers purchase their prepaid cards. This is an option which at once provides automated fare purchasing, fare processing, and security. Hence, it is the most advanced type of technological complexity on our option continuum. The fare instrument itself, the pass or ticket, contains nothing other than an identification number which has been assigned to its user. All other information, from fare purchase to frequency of system use, has been transferred to the computer's memory.

#### b. Fare Sales

Only four major options exist for the sale of prepaid fares where technology is an issue. Passes or other types of fares can be sold under a completely manual system at bus terminals, train stations, stores, and banks. They can also be sold via mail or credit card

using a combination of manual and automated technologies. With this type of payment system, some operations personnel are needed between the buyer of the fare and the automated processing equipment. The third option would be the inclusion of self-service fare machines where the passenger's fare buying needs are handled exclusively through automated devices. Sidewalk vending machines or fare machines in rail stations and elsewhere perform this function. The fourth option is a variation on the third: self-service fare machines are used, but they are tied into a central computer which records the purchase of 'add-fare' and remembers the details of the purchase when the fare instrument is inserted through the fare gate.

c. Security

With respect to types of technology, security is only really an option when considered as an independent variable. Therefore, it is only mentioned briefly here. With the implementation of a 'visual' type of prepaid fare, security must be assured through the human eye. Where a magnetic strip is included, security is taken care of automatically, so long as it is not possible to fraudulently duplicate the magnetic strip and its recording properties. When the fare instrument containing the magnetic strip is used on manual systems, however, security must be carried out manually, since the magnetic strip part of the 'ticket' does not count toward that fare. Under the scenario where the on-line computer is incorporated into the joint prepaid fare system, security is automatically accounted for. More on security later.

8. Marketing

There are four major different marketing strategies that transit operators seeking to implement a joint fare prepayment project may want to consider. The choice of options will depend primarily upon the degree to which operators are amenable to certain types of centralization, and how much individual or collective control each wishes to have over marketing strategies.

OPTION A. Individual Self-Marketing

Under this strategy, each operator would have responsibility and control over the marketing and sale of passes or other types of



prepayment which affect this system. The operator would sell only forms of prepayment which specifically apply to his system and which will constitute fare on that system.

OPTION B. Individual Self-Marketing Via Subcontracting

The operators would retain control over marketing here, but the actual marketing work would be conducted through an outside agency such as a private marketing firm.

OPTION C. Collective Marketing Through a Designated Transit Agency

Marketing strategies here would be the result of collective decision-making by the operators involved in a joint-fare prepayment scheme. An option could be to designate a committee from the RTA, in the case of the San Francisco Bay Area, or perhaps create a new agency from the various operators. If a new agency were created, it might also bear the responsibility for revenue redistribution under certain joint prepaid fare possibilities.

OPTION D. Collective Marketing Through Subcontracting

An alternate marketing strategy would be to determine collectively some major objectives for prepaid fare marketing, and then decide jointly upon a choice for handing the day-to-day marketing responsibilities over to an outside firm. Again, a private marketing firm might be a consideration here. A small standing committee from the collective operators could be maintained to oversee marketing operations, and to recommend any major shifts in policy.

9. Distribution

The possibilities for distributing and selling the various types of prepaid fare range from the highly centralized, tightly controlled alternatives to ones prescribing easy sales and access to prepaid fare outlets. We mention five such scenarios.

OPTION A

Under a highly centralized distribution strategy, sale of prepaid fares must be restricted to the main offices of the transit operators, plus a few major stations in the case of the rail operators. Some surface transit operators may have terminals large enough to

permit sales there. An obvious example of this in the Bay Area is the Transbay Bus Terminal, where AC Transit sells its Transbay passes now.

#### OPTION B

The network begun under a highly centralized strategy is extended to include all train stations and reasonably sized bus terminals. Where decisions to include self-service fare machines have been included as part of a prepaid fare package, the distribution network may be extended even further to include sidewalk vendors, in the case of bus operators. This option, while an extension of the first one, resembles it in that all distribution is controlled and managed through the operators themselves.

#### OPTION C

The operators distribute prepaid fares, such as passes and ticket books, through banks and/or retail outlets. This strategy is already being implemented by the Muni in San Francisco, and, to a lesser degree, by AC Transit in the East Bay. The Muni's retail distribution effort is more varied than is AC's, which prefers to concentrate for the moment on three supermarket chains. The recent development of automatic bank tellers offers the opportunity to permit their installation in transit stations and terminals. These could be programmed to sell passes.

#### OPTION D

Centralized ticket agencies such as BASS and Ticketron sell joint passes. The restriction here would be the type of prepaid fare that is selected. Ticket agencies may not have the capacity to sell certain types of prepaid fares which do not conform to their format.

#### OPTION E

The operators may well consider the possibilities for distributing certain types of prepaid fare via the mail. This could be done either through cash or check purchases, or by credit card. Operators might wish to handle their own mail distribution system, or could have mail order sales handled through a central agency.

## 10. Accountability

There are many kinds of accountability and many concerns relevant to it. With respect to the implementation of a joint-fare prepayment program, four kinds of accountability problems seem to stand out. These represent the primary areas of concern for most operators.

- a. Information which an operator has of both total system ridership and ridership on particular routes.
- b. Given the implementation of a joint fare program, the knowledge available about its usage and ridership. How many joint prepaid fare users are there on a given system, on a particular route, at a certain time of the day or week?
- c. The extent and pattern of joint prepaid fare usage on each participating system for purposes of revenue redistribution (especially if prepaid fares are discounted), and for reimbursement on subsidy accounts.
- d. Accurate and enough information to enable a system to pinpoint significant sources of fraud and abuse, as they are related to joint prepaid fare usage, and to know the extent of revenue losses.

The implementation of procedures to insure certain kinds of accountability are intimately related to other factors such as the types of technology employed and the extent to which operators wish to improve security on their systems.

The options available to operators in the area of accountability depend primarily upon the extent to which fare collection is automated. A transit system with automated fare gates, self-service vendors, and controlled access stations, such as BART, has a high degree of accountability. Ridership and revenue information are recorded either in microprocessors or in a central computer. Because implementation of a joint fare prepayment system will probably entail the continued operation of a type of magnetic ticket technology, this represents no change from the present system of accountability.

However, for transit systems which rely primarily upon manual methods for registering the information relevant to accountability, operations personnel, mainly drivers, must gather the information.



Four options, easily implemented, exist for operators to gather pertinent information. It should be stressed that these options are by no means mutually exclusive.

#### OPTION A

Where prepaid methods such as multiple ride ticket books are used, accountability is not problematic. The passenger surrenders a ticket or some evidence of payment and ridership each time a vehicle is boarded. If an operator wants more specific information such as time of boarding, the farebox can incorporate a device such as a time clock, so that the ticket is stamped upon boarding.

#### OPTION B

Where passes and prepaid fare instruments which are not surrendered upon boarding are used the bus driver or station agent can push the appropriate button on a control panel for each type of pass that is presented. The information is recorded and then registered at the end of a shift or the day, after which the number counter is reset. At rail stations, a special turnstile for pass users would accomplish the same purpose.

#### OPTION C

Electronic fareboxes, now available for buses, can be set up to register when pass users board, activated either by the driver or the passenger.

#### OPTION D

A reasonable level of accountability could be achieved through accurate recording of prepaid fare sales, followed by occasional surveys of prepaid fare usage on various lines of participating transit systems. This alternative would probably provide accurate enough information for purposes of subsidy account billing, revenue distribution, and general prepaid fare usage for pricing and sales distribution.

### 11. Security

When we discuss the issue of security, we are speaking primarily of two kinds of problems. The first is fraud; the altering or counter-

feiting of joint fare instruments. The other problem is abuse, which may not be technically illegal but which involves the use of prepaid fares in such a way that more usage is obtained from the fare instrument than was intended by operators. An instance of this might be pass holders lending their passes to ineligible parties. Another example, applicable only on certain rail systems such as BART, is when passengers disembark and then reboard at midway stations on a trip in order to take advantage of tariff quirks which price a long ride above the cost of two shorter ones.

There are three basic options which can be implemented to curb most potential security problems with joint fare usage.

#### OPTION A

Use the technology built into the fare system, or modify the present technology to increase security. This option is primarily applicable to systems with automatic fare gate technology, and is most appropriate for controlled access transit systems such as BART and the Muni Metro. The technological details are not necessary here, but under a program where technology or machines are expected to provide for security, tickets and microprocessors would be designed to read stations of entry and exit, pass values, the day and month, and the time of day. In the future, technology might permit miniaturization to the degree where automated fare machines are practical for surface transit, and can provide fare security for bus systems. In any case, security which relies upon technology, while expensive, makes abuse and fraud problems such as counterfeiting difficult and expensive.

#### OPTION B

Another option which may, in fact, be implemented in addition to Option A, is to have roving inspectors or police perform security functions. The employment and deployment of roving inspectors is a necessity where a complete self-service prepaid system is instituted that includes bus lines. In North America, the LRT system in Edmonton, Alberta, incorporates this type of security, and it is planned for the San Diego LRT opening in 1981.

Roving inspectors have the authority to inspect the prepaid fare instruments of passengers, and to issue citations where infractions have occurred. Their use is likely to be of greatest value on surface transit systems. The possibility that one may be randomly inspected for proof of legitimate fare payment is probably enough to dissuade most from abusing or defrauding the system.

#### OPTION C

Do nothing. This is appropriate if the cure were more expensive than the malady. In fact, abuses of the sort described earlier may be minimal, and may not warrant extra security at all. This is a matter for empirical investigation.

#### 12. Organization/Administration of the Scheme

The issue of the comprehensiveness or even acceptance of a joint fare program hinges upon the extent to which operators are willing at this stage (or later) to engage in joint planning, tailoring those aspects of their operations which require it to a regional, multi-system program of passes and transfers. The options here range from the most incremental type of approach, based upon the present organization and technology of the various operators to much more comprehensive schemes oriented more to the distant future.

This is not the place to outline alternatives to redesign the organizations of each of the transit operations, or to recommend different linkages among these organizations. Rather, the options discussed are the most general ones relating to the manner and extent to which operators will jointly want to come to terms in various issue areas. The degree of inclusiveness of any joint fare prepayment program will depend upon the degree to which the operators are willing to agree to decide collectively upon matters relating to the development of such a program.

#### OPTION A

Leave the organizational interfaces among the transit operators as they are now (in the San Francisco Bay Area). Agreements upon matters relating to joint fare prepayment will then be decided upon at informal meetings among general managers and staff, with some formal recognition given the program through the RTA. Under

this framework, the joint fare prepayment project remains an issue to be considered and dealt with in conjunction with other matters that occupy the attention of the RTA.

#### OPTION B

Formalize specific agreements and intentions with respect to joint fares and designate an RTA committee to proceed with implementation plans. Commit resources to carry out a program and designate it a priority item. Under this option, decisions are still worked out individually at the general manager and staff levels in each organization, and compromises are reached in committee.

#### OPTION C

Extend Option B and give RTA its own staff and offices.

#### OPTION D

Federate the various transit operators. This could be done so that all planning, fare-setting, marketing, and policymaking function are incorporated into a confederated arrangement where decisions are made jointly. This option could be scaled down and tailored so that only decisions directly relevant to joint fares are made in a 'federated' context. With this option, there would be a certain degree of staff sharing to facilitate the decision-making process.

#### OPTION E

Merge the systems, eliminating the interface problems.\*

### B. Evaluation Criteria

In order to make a reasonable assessment of the feasibility of any joint fare program, those involved will want to begin to assess the criteria by which the merits of any proposal can be judged. Such a program, in any of its possible forms, cannot be considered entirely by itself, on its own merits. In addition to the broad sets of criteria under the headings listed

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\*Mergers do not automatically eliminate preexisting intersystems barriers; two decades after the merger of several private bus companies into the New York City Transit Authority, free transfers are still available only between routes which belonged to the same predecessor system.



below, joint fares should be judged directly in relation to the fare system which the various operators now utilize, to see whether or not the adoption of various of the prepayment possibilities really amounts to a substantial change. We believe that the sets of feasibility guidelines mentioned below will assist in providing an analytical framework for careful consideration by those considering implementing joint prepaid fares. The dimensions of the problems are not independent of everything else and do not occur in a vacuum, but rather are part of what transit personnel conceive as the proper present and future paths for public transportation in this country.

#### 1. Technological Feasibility

The list of technological alternatives as described briefly under the heading of 'options' ranges from the simple to the complex; from the inexpensive to the highly capital-intensive.

- a. Assuming that operators want to establish a joint fare program — that it is an idea 'whose time has come' — careful consideration must be given as to whether technological change is really necessary at all. The term 'technological change' here refers to changes in the basic operating equipment of transit systems such as fare gates, fareboxes on buses, fare vending machines, access doors on buses, and the like. All facets of change in transit systems are assumed to involve technology, but for the purposes of our consideration here, we exclude such minor adaptations as, for examples, printing passes on thicker paper or laminating them.
- b. If it is determined that changes in technology are required for the implementation of joint fares, evaluation of the capacity and adaptability of present equipment should be made. If the necessary changes can be incorporated into the existing machinery, the costs of pursuing this course relative to purchasing new equipment ought to be computed. Long range plans for capital equipment purchases need to be considered as part of the evaluation process.
- c. If, after consideration of the above, it is decided that new equipment is necessary, determination must be made whether it is possible to purchase previously designed machinery which will accomplish all of the necessary tasks. If this is not the case, research and development (R & D) will be required to produce the requisite equip-

ment. In this case, operators are dealing with a new technology and serious questions over the uncertainty of the finished product arise. Three questions must be asked before embarking upon the purchase of new, expensive machinery. When will the product be completed? Will it be reliable? Will it do all that it is intended to do? Where any technological adaptations are anticipated, whether they are modifications of present equipment or additions of new stock, if R & D is required, operators will want to know whether that work can be carried out by in-house engineers or whether it has to be done by outside contractors.

- d. A most important criterion for consideration is the future overall technology plans and needs of a transit system. Are changes which are required for a particular joint fares program compatible with the technological changes necessary in the future for the overall purposes of transit operators?
- e. A last consideration which is the sum of all others is the cost effectiveness of choices in technology. What technology accomplishes the most at the least cost in, say, 5 years or 10 years?

## 2. Operational Feasibility

The problems associated with the operational simplicity of a joint fare system are mainly organizational ones, and they must be considered directly in relation to the present system of conducting business. Unlike the other sets of criteria, these are more closely associated with the transit personnel directly involved with handling passengers and fares. Indeed, they are the backbone of any transit system.

- a. Does the implementation of a joint fare system present complexities for operating personnel that do not presently exist? Questions about the complexity of joint fares relate directly to qualitative changes in fare collection methods.

Two areas of evaluation should be pursued. Where joint fare collection is automated, does the addition of joint fare processing equipment entail closer inspection and/or increased maintenance over automatic equipment not processing joint fares?

Under an alternative where joint fares are handled manually by bus drivers, station agents, or others, it should be determined whether extra work is entailed in fare processing. For instance, are bus drivers required to carefully inspect joint fare instruments to check for validation or counterfeiting? How many variations of fare instruments are there to inspect?

- b. Questions about the systematic effects of joint fares are extremely important, and should be criteria of very high priority. For instance, does the adoption of prepaid fares hinder or improve operational efficiency? Are boarding times shortened? What are consequences for maximizing the use of the existing number of vehicles for transit use? Does this entail savings in capital costs for vehicle purchases? Likewise, if operational efficiency is hindered, are there hidden capital costs to implementing joint fares?
- c. What is the abuse and/or fraud factor in a transit system utilizing joint prepaid fares? If this element of a prepayment system is significantly greater than what presently exists, what are its effects upon the operational effectiveness of the transit system? Do necessary security precautions get in the way of a transit system's primary task?
- d. Considerations must be given to the present work contracts of transit employees. Given what is required to implement various of the joint fare alternatives, can employees be reasonably expected to fulfill their tasks under existing union work agreements?

### 3. Financial Feasibility

The criteria which, in large measure, determine the feasibility limits for implementing joint fares are those related to financing the expense of such a program.

- a. The operators will want to know whether or not an option for joint prepaid fares can be carried out without extra subsidy. Even if this is financially possible, is it an option they wish to pursue?
- b. Assuming some revenue losses result from discounting joint fares or from fraud and abuse (above what is normally experienced), what is the level of subsidy that is required to offset these revenue

losses? At this point, serious consideration must be given to which subsidy sources operators want to pursue. Some alternatives may have strings attached of which some operators may want no part.

- c. What capital costs are required? (For more insight into the complexities of this criterion, refer to the information under heading "Technological Feasibility.")
- d. What would be the administrative and personnel costs under various possible options for a plan? Do operators want these costs subsidized, or should these types of cost increases be built into fare pricing schemes? Alternatively, are such costs small enough to ignore?
- e. A most important criterion for the operators is to consider how significant accountability is for their systems with respect to joint fares. Do they want better accountability than they have now? Are the alternatives available for joint fare schemes amenable to clear accountability for costs, revenues, and knowledge of ridership?

#### 4. Marketability

Marketing success is of major importance in prepayment programs, somewhat less so for promoting single fares. The criteria to be considered in determining whether or not a particular joint fare option has marketing feasibility are guided by the assumption that patrons will be attracted by a joint fare program according to the availability, price, and ease of usage of the fare instrument. The following sets of questions outlining marketing feasibility criteria can be raised:

- a. Is each option easy to explain, understand and use?
- b. Do any options require special efforts to educate users? Is there an identity problem for intersystem passes and tickets?
- c. Can prepaid fare instruments be distributed through existing ticket outlets? Is there something special about a particular joint prepaid fare option that requires special or expanded distribution?
- d. What payment methods are possible?
- e. What is the market, and how is it addressed most effectively?



- f. How attractive are each of the possible options in terms of costs and benefits for the users? Is the marketing program to be predicated on convenience or on financial savings?

### C. Operator Attitudes

In order to relate the substance of a joint-fare demonstration proposal to the ideas and wishes of the individual operators in the San Francisco Bay Area, representatives of the major operators (listed in Appendix B) were interviewed and their attitudes and opinions elicited. It should be stressed that in some cases responses were obtained to specific proposals which were under consideration at that time, and some of which have changed substantially or have been eliminated since then. The interviews concentrated on the pre-paid pass component of the total plan; intersystem single-trip tickets were not discussed at length.

The interviews were conducted between February and June 1980. Most of those interviewed were planning staff. However, in some instances policy-making, managerial, marketing, and operations people were sought out, and responded to the various ideas proposed for a joint-fare scheme. Planners were concentrated upon primarily because they were most familiar with the RTA's decisions, and also with the mechanics of working out the dynamics of possible or necessary changes for their respective systems in the incorporation of joint-fare proposals. During the course of the interviews, the authors' ideas for the mechanics of the demonstration project progressed from very general to fairly specific. The information garnered from these talks helped significantly in shaping a tentative design for the project. In this respect, the interviews served a very important feedback function for the proposal.

The summary of the attitude survey is presented here; a system-by-system appraisal is found in Appendix B.

#### 1. General Attitudes of Operators to Joint-Fare Prepayment Schemes

Without exception, it seems to be the opinion of Bay Area transit operators that a greater degree of regional coordination is necessary and, more specifically, that the idea of a regional pass is "one whose time has come." There was general agreement on a general problem. There were many general and detailed criticisms of various aspects of the proposal and its antecedents from individuals representing transit

operations. In certain rare instances where an official saw little value in any of the ideas proposed and did not offer alternatives relevant to a joint-fare prepayment scheme, the question of whether that system was not interested in any "joint pass" proposal was put to the respondent. The answer was always that they were interested. The bottom line seems to be that, at least philosophically, everyone thinks an intersystem pass is a suitable goal. This seems to be a sincere opinion when expressed in general terms, and one not aired simply because it is expedient to do so for reasons of public opinion.

## 2. General Reservations

Aside from the varying degree of enthusiasm expressed by transit officials for the virtues of a joint fare prepayment system, several concerns were voiced. Mention is made here of the most significant of these.

It is the opinion of some officials that a joint fare system is primarily designed to increase the transit market, as well as eliminate the inconvenience for patrons utilizing more than one system. A common response by these individuals is that a seller's market presently exists for the commuter traffic in the transit industry, and that the demand curve would not be significantly altered by the incorporation of a joint-fare pass.

Second, in view of all the pressing problems facing transit operators in the Bay Area, some respondents regarded the joint-pass concept as an interesting, but low priority item.\* The present transfer arrangements among operators function adequately to eliminate inconvenience for commuters and other patrons.

Third, the financial future of transit in the Bay Area is uncertain and the addition of a joint-fare prepayment system would strain already limited resources further. Moreover, there was some skepticism about the source of funds for such a program. Some expressed a strong concern that any further demand on resources would engender a "rob Peter to pay Paul" scenario for TDA and other transit funding sources.

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\*These interviews were conducted before the June 3, 1980, primary, which contained an initiative to decrease substantially state income taxes and, hence, state aid to local government, during the time of budget meetings, and prior to MTC's decision to set aside \$4 million of BART's, Muni's, and AC's AB 1107 allocations for joint-fare implementation.

Another worry for some transit officials was the problem of the equitable division of revenues once the interface has begun. Who pays whom? On what basis are divisions of monies made? And can this be done to everyone's mutual satisfaction? The mechanics of accomplishing the task of revenue redistribution was a concern mentioned more than once. Who is the "banker" or the accountant in such a scheme?

Last, and more serious, was the problem of the idea of the inter-system pass itself. The plan takes the existence of intrasystem passes as the necessary condition for its intersystem counterpart. Only four systems — AC, Muni, SP, and Santa Clara — have incorporated commuter passes within their tariffs. The establishment of a bona fide joint-fare prepayment system would almost certainly demand the addition of internal system passes for other participating operators. At this level, the issue is no longer interorganizational cooperation and compromise, but some intraorganizational change for the systems without passes at present.

### 3. Reservations Concerning A Daily or Weekly Pass

Daily and/or weekly joint passes were the most problematic ones in the view of the majority of the operators. Those who commented on the prospects for a daily or weekly pass can be roughly segregated into two groups. The first group includes those who already had some diffuse and specific concerns about any joint-pass system. The primary difficulties stemmed from the complexities of establishing a fare structure for day pass users wishing to ride multiple systems. Bus drivers would have to memorize possibly complex fares and the operators would have to establish a reliable system for fare accountability and revenue redistribution. The solution might be a more capital intensive technology which could eliminate these difficulties. BART management, for instance, has unequivocally rejected the possibility of a daily or weekly joint pass for the near future. The technological problems are insurmountable in the short term.

The other group of respondents were those ready and willing to go ahead with a joint fare prepayment program, but also wanting to do so soon. The prospect of further difficulties that would result in

the delay of implementation was a particularly distasteful prospect for them.\*

4. General Attitudes Relevant to the Specific Joint-Fare Proposal

The proposal, in its basic form, generated very little criticism from the representatives of the seven systems. Those systems already utilizing a pass were particularly pleased with the ideas of the proposal. Its strongest attribute seemed to be its relative simplicity and ease of implementation, relative to other possibilities. The operators who favored a joint-fare prepayment system regarded the plan highly primarily for three reasons. First, little has to be changed in the present administration of transit operations. Second, in view of only minor administrative changes, problems of intersystem coordination seem to be minimal under the plan's guidelines. And third, the relative autonomy which each system has in designing zone and fare structures would not be seriously threatened by the implementation of the proposal. Earlier interviews indicated that this would be a very major point of contention with the various operators, if zones and fares were attempted to be coordinated in a grand scheme. Acceptance of a common definition of what constitutes a fair division of fares and zones in a scheme worked out from the top continues to be a thorny problem.

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\*There is one exception in the group of significant decision makers on this point, but he seems to be willing to concede the difficulties of the daily and weekly passes.



## V. METHODOLOGY FOR THE JOINT FARE PLAN DESIGN

Many sets of problems have been raised with respect to possible joint transit fares. For purposes of analysis, the major issues have been segregated into discernible option categories, with multiple possibilities within each. Anyone familiar with the transit industry, or with any complex organization, will recognize that these options do not exist in a vacuum, and that, in fact, they are all highly interdependent. However, the logic of any joint fare proposal cannot be properly understood without having considered the component parts that make up the substance of the plan.

All the categories discussed in Section IV. A. of this report are composed of options which progress from the simple to the complex. Depending upon the issues being considered, this presents different ramifications. Where the problems of technology are at issue, the most complex "solution" is the most expensive and the one which has an implementation time frame well into the future. However, as the interviews with representatives of the major transit systems of the San Francisco Bay Area indicate, some operators are anxious to proceed with joint fares in the very near future. Others, while they do not see a need for joint fares with quite such urgency, are wary of heavy capital investment in a technology which may have to be worked out and which may not be reliable. Some have had considerable experience with these kinds of difficulties.

Whereas complexity in technology engenders serious doubts about cost effectiveness, complexity in the design of a pricing and discounting scheme poses different problems. The simple across-the-board solution may not be the most elegant for systems which have different pricing needs and varied sources of revenue. Each set of options must be evaluated on its own terms and according to how a choice interfaces with possible options in other categories.

Accordingly, the questions discussed in Section IV. B., "Evaluation Criteria", combine the most significant concerns that operators may have when judging the probable consequences of incorporating joint fares into their systems. Each category has been termed a type of "feasibility" because it takes into account the values of operators as well as the facts of implementing a joint fare program. The "facts", as they pertain to this study, are the positions of the various operators, both organizationally and technologi-

cally, with respect to joint fares, and also the steps which have already been taken to accommodate the initiation of joint fares. Some operators have far to go, while others have made substantial progress in this direction. As a specific example, when considering the prepayment aspects of a complete joint fare program, it is recognized that some operators have already quite successfully established intrasystem prepaid fares.

The authors have been constantly aware that different operators perceive the implementation of joint fares, and particularly some of the options which have been discussed, with differing degrees of salience. These opinions are usually well founded. Therefore, the design of a workable joint fare program gives paramount consideration to what presently exists in the region. An incremental approach has been adopted on the grounds that a reasonably effective result can best be achieved utilizing as much as possible the present organization and tariff structure of the transit operators who will be involved. A too ambitious proposal at this stage would probably set the implementation time for a program into the far future. Recommendations have been made with the thought in mind that, where the costs of error or failure are least, compromise is easiest.

For the long term, a much more sweeping set of suggestions could be outlined. Instead of selecting "satisficing" alternatives for the operators to consider, solutions could be chosen with the goal of maximizing regionwide transit travel convenience. This would require a unified regional tariff covering both intrasystem and intersystem fares. Such a plan would assure equitable prices and flexible choice of alternative systems to passengers. However, it would require some operators to make major changes in their policy regarding their fare structure, not to mention fare collection and accounting procedures.

#### Prepayment of Transit Fares

Prepayment of transit fares is an integral part of the joint fare program developed in this study. It has been alluded to in the list of options; it deserves special emphasis here before details of the plan are described. However, for a detailed discussion the reader is referred to a report by Huron.\*

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\*The Huron River Group. Transit Fare Prepayment. Washington, DC: U.S. Urban Mass Transportation Administration. Report No. DOT-TSC-UMTA-76-7, Aug. 1976. 169 p.

Fare prepayment's most important advantage for joint fare schemes is that transactions do not take place on transit vehicles. Joint fares are likely to have a more complex structure than typical tariffs applying within a single system, and are therefore more difficult to administer. To the extent that joint fares are collected on transit vehicles, boarding times, inaccuracies (overcharging or undercharging), and the work load of vehicle operators are likely to increase. The situation is not as critical in rail transit stations, but even here fare prepayment offers the advantage of reducing the load on ticket vendors or vending machines.

Other advantages of fare prepayment include:

- Favorable cash "float" for the transit operator, unless the use of credit cards is permitted.
- Reduction in the use of transfers, and in the boarding time and costs associated with them.
- Increased security of funds; less money in fareboxes or in the subsequent processing stream.
- Higher revenues if not all prepayment opportunities are utilized (i.e., not all tickets in a multiride book are used prior to the expiration date, or less than the number of trips at which the pass is priced are made), e.g., during vacation periods.
- Possibly higher revenues from induced transit traffic previously travelling on other modes.
- Increased passenger convenience; no exact fare needed on each trip.

Disadvantages of fare prepayment include:

- Lower revenues because of discounts offered in multiride ticket book sales, or when more trips per month are made on passes than the price basis of these passes, provided that the extra trips would have been made on transit for a cash fare.
- Possible loss of revenue from abuse (loopholes) or fraud.
- Added administrative burden of printing, marketing, and auditing the prepayment instrument.

To repeat the main advantage, however, it can be said that those transit systems which have complex fare structures, including groups of systems offering joint fares, can operate efficiently only if a major proportion of peak period fare transactions do not occur on surface transit vehicles.

Multiride ticket books have been a part of transit tariffs in many U. S. systems for decades. They may have a time limit - perhaps 60 days from the date of purchase or the end of a calendar month - or they may have no such restriction. They are usually transferable to persons other than the buyer.

Passes - defined as instruments which permit an unlimited number of trips within a stated time period and within a stated zone or route segment - have been added more recently to transit fare alternatives in the U.S., although they have been in common use in Europe for many years. They can be weekly, biweekly, semimonthly, or monthly; even annual passes, paid for in monthly installments, are offered in some tariffs. Some systems (especially in Europe) insist on restricting the pass to the purchaser's use, going so far as to include a photograph on the pass (in which case the pass becomes a semipermanent document, revalidated each week, month, or other period, by affixing a stamp or decal) or on a jacket which must always accompany the pass. In the U. S., transferable passes have been the more general rule; it is generally felt that, provided each pass can be used by only one person at the height of each peak period, the marginal cost of carrying passengers other than the purchaser at off-peak times are not worth the effort to enforce nontransferability.



## VI. DESIGN OF A JOINT FARE PLAN

In any metropolitan regions where more than one urban transit agency operates, coordination can be achieved by a number of mechanisms. Four are listed here in increasing order of "regimentation".

- Informal or semiformal agreements by two or more carriers to remove some of the inconveniences of intersystem transferring, such as re-locating bus stops or even routes to improve connections, coordinating schedules and/or accepting each other's transfers.
- Formal contracts which, in addition to provisions such as mentioned above, also involve joint fares and formulae for redistributing revenues received in case of unbalanced receipts.
- A regional transit federation, which establishes a regionwide fare system, collects all revenues, and distributes them to the participating transit agencies. This federation also assumes the broader aspects of route planning, service level determination, and public information.\*
- Mergers, which should eliminate coordination problems if executed correctly.

In the San Francisco Bay Area, the political climate presently militates against the third and fourth of these alternatives. The first option, is already used in an ad hoc fashion (see, for example, Table 3).

An analysis of the existing conditions, the goals of the region for improved transit service, and the attitudes of policymakers and managers, leads to the development of a plan roughly corresponding to the second in the above list of options. Informal agreements may be easier to achieve; federation or merger may result in more efficient regional transit service; formal joint-fare contract arrangements, however, appear to provide the optimum trade-off between political feasibility and transit efficiency for the Bay Area.

It is inherent in devising a joint-fare scheme for a region as large as the Bay Area and involving not only so many major operators but also so many

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\*For further details see: Homburger, Wolfgang S. and Vukan R. Vuchic. *Federation of Transit Agencies as a Solution for Service Integration*. Traffic Quarterly, vol. XXIV, no. 3, July 1970. pp. 373-392.

different kinds of fares that the plan cannot be implemented all at one time. Chapter VII will describe the stages which suggest themselves for implementation, and the components of each stage.

The plan generally fulfills the criteria discussed earlier, with special emphasis on simplicity. It is based on existing fare structures of the major carriers involved, but not all features of the present tariffs are necessarily brought into the scheme. Thus, passes are a major cornerstone of the plan, but multiride tickets have not been included. It must be emphasized that the joint-fare plan does not replace individual tariffs; thus, any system can continue the use of multiride books of tickets for intrasystem trips, even if they cannot be used without issue of an additional transfer for intersystem travel.

#### A. Monthly Passes

It is proposed that multisystem passes be based on passes offered currently by individual systems. This implies that those systems not yet using passes will decide or be persuaded to introduce them. The Central Contra Costa Transit Authority (CCCTA), TriDelta Transit (TDT), Western Contra Costa County Transit Authority (WCCTA), and the Livermore Valley area (LV) are each treated here as a zone within which monthly passes will also be available. It is assumed that the fare zones in AC Transit, Golden Gate, Samtrans, and Southern Pacific, will continue to exist either in their present or in a modified form. The form of passes on BART will be discussed in Section A.6 below.

Given that the entire region is covered by territories in which transit passes are valid, the multisystem passes are superimposed as follows:

1. General. A standard multisystem pass will be designed. This pass will contain magnetic information of a form which will be compatible with Muni Metro fare gates, and with BART gates after these have been modified to process monthly passes. It will be noted from Table 6 that more than 90 percent of intersystem transfers involve BART, the Muni, or both: hence, magnetic coding will be wasted on less than 10 percent of all passes manufactured. (It is impractical to split Muni passes into those which can be used on Muni Metro and those which can only be used on buses and trolley coaches.)
2. Vending. A vending machine will be designed which prints and magnetically codes multisystem passes, and keeps a count of all transactions. There will be two versions:

- a. Office use — installed in headquarters offices of transit systems, in ticket offices at major Southern Pacific stations, the Transbay Terminal, and Golden Gate Ferry terminals. These will operate in response to commands of the clerks operating the machines.
- b. Public use — installed at BART and Muni Metro stations, at the busiest Southern Pacific stations, at the Transbay Terminal, and at Golden Gate Ferry terminals. These will probably have to accept magnetized credit cards, although the possibility of accepting payment in bills up to \$20 denomination should be explored. It must be remembered that the cost of passes can range from about \$20 to perhaps \$100. These machines could be combined with automatic tellers and be owned and maintained by banks.

These outlets cover the market quite effectively. The following are derived from Table 6.

Intersystem commuters passing through:

BART stations	- 22,335 - 72%
SP stations	- 4,150 - 13%
Transbay Terminal	- 3,175 - 10%

All others, some of who pass through Muni Metro

stations and/or Golden Gate Ferry terminals: - 1,575 - 5%

Banks, supermarkets, and other retail outlets will not be used for intersystem pass sales. Mail-order sales by the headquarters offices of each transit system should, however, be a major component of any marketing scheme, assuring access of all potential customers to multi-system passes. The vending machines should also be programmed to sell single-system passes and serve as additional outlets for marketing these.

The staffed outlets present an operating cost problem. There will be no demand to purchase passes for a period of perhaps 20 days a month, and clerks selling passes will also have to be assigned other work. This is why only the outlets mentioned in 2.a. above are suggested; these are staffed for other purposes in any case, and the sale of multisystem passes becomes merely an additional duty. However, the problem of peaks in the work load must not be overlooked.

3. Pass Design. Each pass will have space on the front face (magnetic strip side) for the imprint of the following:

- a. Logo of system where ticket is issued, or of any system involved.
- b. Zone(s) of that system within which pass is valid, if applicable.
- c. Month of validity.
- d. Price charged (can be in small print).

On the reverse side, there will be room for two additional logos (with zone number, if applicable) to be printed, and for the month of validity to be repeated.

The card stock used can be specially selected (colors, background design) to make forgeries as difficult as possible. The stock can be changed at random intervals if security problems arise, but all transit operating personnel will have to be notified whenever such a change occurs.

4. Pricing. In determining the prices of joint passes, several factors must be kept in mind:

- Monthly passes of individual systems are discounted from what the cost of paying single-ride fares would be. As shown in Table 2 prices in the San Francisco region range from 36 cash fares on AC Transit down to about 20 single fares in some Southern Pacific situations. (In other regions, prices are often set at 40 single fares). If 21 work days are assumed to comprise a typical month (42 commute trips), then monthly passes offer discounts from 15 to about 50 percent for commuting alone, not considering other uses of the pass.
- Those systems which serve mutually exclusive territories, interface end-to-end. Trips across these boundaries tend to be long, and have historically involved payment of additional fares.
- Where two systems offer service in the same corridor — in the Bay Area one is BART or the SP in this case — the relationship is of the feeder-trunkline interface type. The feeder portion of transfer trips is often relatively short; it is possible to avoid using the rail system altogether where the surface system provides parallel service. Therefore, transfers should be offered at a substantial discount or gratis.



- If a joint pass is offered at the sum of the prices of the individual system passes being combined (no discount), it becomes merely a convenience to passengers and offers no financial inducement. Market penetration is then likely to be low, and it is unlikely that new traffic will be diverted from automobile commuting.

Based on these considerations, the following pricing structure is proposed for monthly passes valid on two or more transit systems:

- a. End-to-end transfers between systems (i.e., all interfaces not listed in 4.b.) are discounted 10 percent below the sum of the two passes which apply to the systems meeting at the interface, or are priced at 32 times the sum of the single fares on the two systems, whichever is greater. The second provision applies only if one or both of the passes being combined is priced substantially below 36 single fares, and is primarily needed to prevent the Muni/AC Transit joint pass from underpricing transbay trips via BART to such an extent that substantial numbers of passengers would shift from BART to AC Transbay service. (The floor of 32 single fares is the result of discounting 36 single fares by about 10 percent.)
- b. Feeder-trunkline transfers include BART↔Muni, BART↔AC Transit, SP↔Muni, SP↔Samtrans, and SP↔Santa Clara. Joint passes for these interfaces are proposed to be priced at the cost of the rail system's pass plus 18 single fares charged by the feeder system (in one zone, if the system is zoned). This increases the 50 percent discount which is already offered in the BART arrangements with Muni and AC Transit to 55 percent. Even greater discounts could be appropriate. In fact, if interfacing operators agreed — and if sufficient subsidy funds were appropriated — the pass of one system could be honored on the other without any additional payment by the passenger for the extra service thus provided. This corresponds to the current honoring by Samtrans of SP tickets and to the proposal by Muni that its FastPass be honored by BART within San Francisco. However, potentially enormous increase in subsidy costs could result, as discussed later.

Because BART uses distance-related fares while AC Transit uses a zone system for its Transbay services and a universal fare for

Eastbay local trips, joint passes between any two points using BART cannot always equal those for an alternate route not using BART. Table 7 shows, however, that the differences are not very large.

- c. Three-system trips occur primarily in connection with BART or the Southern Pacific, with both transfers being of the feeder type. In order to make three-system passes an attractive purchase, and since the number involved (and, hence, the subsidy required) is not large, the third system (second feeder system) is added for a price of 10 single fares of that system. In the case of AC/BART/Muni, the first feeder system adds \$9 to the pass price, and the second \$5. For passes involving the SP, however, a special table of prices will have to be developed, since the base fares of the Muni, Samtrans, and the Santa Clara Transit System differ from each other.
5. System Revenues and Subsidies. Each system whose logo appears on a joint pass will be entitled to received as revenue the same amount as if it had sold an intrasystem pass at the current price. Since the passes are sold at discounts, subsidies are required to cover the difference between the joint pass price and the sum of the prices of the intrasystem passes being combined. This is discussed further below.

To administer the system, an accounting and fund transfer mechanism must be established. This is partly incorporated in the vending machines described earlier. The records from each machine can be used to calculate the amount of money due each transit operation in the scheme. The money collected by clerks, by the self-service machines, or via credit card companies is deposited in the account of whichever system made the sale. By about the 10th of each month these data are reported to a central accounting agency either from a central computer (which is part of one alternative hardware configuration) or by accounting clerks of each system. The central accounting office can be one of the transit operators or the MTC, as agreed upon by the RTA. These data will show:

- a. the amount of money collected above that due the system if each pass sold had been an intrasystem pass;
- b. the amount due each system from joint passes sold by other systems;
- c. the difference (b. - a.), which amount is due each system from the central subsidy fund.

TABLE 7 — SELECTED PRICES FOR BART/MUNI/AC JOINT PASSES

	Surface Transit			BART <sup>†</sup> only	BART plus: <sup>††</sup>		
	Muni	AC	Muni/ AC		Muni	AC	AC & Muni
Intra-San Francisco	\$16	\$ -	\$ -	\$18	\$27	\$ -	\$ -
Daly City - S.F.	16	-	-	32	41	-	-
Downtown Oakland - S.F.	-	36	48	34	43	43	48
Coliseum - S.F.	-	36	48	45	54	54	59
Rockridge - S.F.	-	36	48	41	50	50	55
Berkeley - S.F.	-	36	48	40	49	49	54
El Cerrito D.N. - S.F.	-	45	56	45	54	54	59
Bay Fair - S.F.	-	45	56	52	61	61	66
Hayward - S.F.	-	54	64	54	63	63	68
Berkeley - Oakland	-	18	-	18	-	27	-
El Cerrito D.N. - Oakland	-	18*	-	27	-	36	-
Coliseum - Oakland	-	18	-	18	-	27	-
Bay Fair - Oakland	-	18*	-	32	-	41	-
Hayward - Oakland	-	18*	-	38	-	47	-
	AC Transbay plus BART Express Bus			BART Transbay plus BART Express Bus			
	<u>No Muni</u>		<u>With Muni</u>	<u>No Muni</u>		<u>With Muni</u>	
Pinole - S.F.	\$57		\$62	\$57		\$62	
Livermore - S.F.	65		70	71		76	

\* On local buses.

† BART monthly pass assumed to be priced at 36 single BART fares.

†† First feeder system pass addition assumed to be priced at \$9;

second feeder system pass added for \$5.

(There is no plausible non-BART alternative from the CCCTA and TDT areas.)

This arrangement, however, works only if at least a nominal price is charged to add the logo of a second system to the pass of the first one. If, for example, Samtrans continues its present arrangement with the SP, there is no automatic way of knowing how many of all SP passes are actually used on Samtrans feeder buses. Thus, periodic certified counts would have to be made, and a formula agreed upon which converts these counts into equivalent numbers of commuters. In the case of BART honoring Muni passes, such counts would be produced by the fare gates.

6. BART Passes and Fare Gate Technology. A special study is being undertaken by BART to determine the feasibility of different types of intra-system pass schemes and of the fare gate technology required to administer them. These matters are quite specialized and beyond the scope of this report. However, two summary comments are required to show that BART could fit into the joint-pass program.
  - a. Pass structure. BART passes should probably offer unlimited rides in one calendar month, provided that the single fare of each ride taken does not exceed the "face value" of the pass. Passes would be sold at face values from the lowest to the highest fare in the fare matrix (currently 50¢ and \$1.75 respectively). Passes would be priced at somewhere from 36 to 40 times the face value; the lower end of this range has been assumed in subsequent calculations.
  - b. Fare gate technology. The present fare gate logic might be altered to recognize passes and process them in a manner different from normal store fare tickets. No value would be subtracted, but travelers whose cost of the trip just completed exceeds the face value of the pass would be sent to the ADDFARE machine.\* This offers an obvious loophole to intrepid riders; a commute trip could be interrupted at about the halfway point, the traveler could exit and then reenter to complete the journey; this would permit the use of a pass with a lower face value than intended. Whether such abuse would be substantial is doubtful in view of the crowded con-

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\*The ADDFARE machine accepts cash payment to bring a ticket with insufficient funds to the value required for exit. It is located in the "paid area" of each station.



ditions during peak periods and the time lost by the passenger in such a maneuver.

Alternatively, a more sophisticated scheme would involve a central computer connected to all fare gates and vending machines. Each pass would be coded only with a serial number and a code identifying it as a pass; all the remaining information, such as expiration date, face value, entry/exit code, and station of entry, would be stored in the computer. The logic could be programmed (and the purchaser informed of this) to prevent a pass from being used to enter the system less than, say, 10 minutes after the previous exit. This would eliminate the loophole described above. However, backup redundancy must be provided to assure that this system can process passes even if a component of the computer-linked network becomes inoperative.

7. Potential Market for Multisystem Passes. The proportion of all commuters who are estimated to purchase monthly passes ("market penetration") appears to depend on three factors:
  - a. Relation of pass price to single fare.
  - b. Absolute pass price — reluctance to pay a large sum of money.
  - c. Opportunities for extra use of passes.

The first factor was investigated by obtaining data from six California transit systems of the market penetration of their passes and the ratio of pass price to single fare. No claim is made here that this resulted in an accurate market penetration forecasting tool, but a simple regression yielded the following equation:

$$MP = 175 - 3.4 \left( \frac{PP}{SF} \right)$$

where: MP is the market penetration in percent of all commuters;

PP is the pass price;

SF is the single fare.

All passes covered in this survey were priced at or below \$30 (except for negligible sales of AC Transbay Zone 2 and Zone 3 passes, which were excluded from the above regression). Nothing is known about the

relationship between market penetration and the absolute pass price. It was assumed that market penetration would decrease as the pass price rises, but that the rate of decrease is less if credit cards are accepted than if cash or a check is demanded.

The third variable mentioned above is even more difficult to quantify. One can postulate that a Muni pass provides many opportunities for off-peak and weekend trips to the holder. On the other extreme, an Eastbay commuter with an AC Transbay pass working in San Francisco cannot use this pass during weekday midday periods conveniently (a round trip to the Eastbay is an unlikely lunchtime activity). In this study it was therefore assumed that any joint pass including the Muni would be somewhat more attractive than passes which do not include that system.

The complete equation used for market penetration calculations is:

$$MP = 175 - 3.4 \left( \frac{PP}{SF} \right) - c(PP - 25) + m$$

where:

$$c = \begin{cases} \text{zero if } PP \leq \$25, \\ 0.33 \text{ if } PP > \$25 \text{ and credit cards are accepted,} \\ 1.00 \text{ if } PP > \$25 \text{ and credit cards are not accepted.} \end{cases}$$

$$m = \begin{cases} 10 \text{ if the Muni is one of the systems included,} \\ \text{zero otherwise.} \end{cases}$$

The resulting market for multisystem passes, and subsidies which these would entail, are shown in Table 8. For the BART/Muni interface and for the SP corridor, alternate pricing schemes are shown. The differences are in the method of pricing feeder transfers: one alternative uses the prices mentioned in 4.b. above, while the other assumes free feeder service (SP passes honored on feeder lines, Muni passes honored on BART).

In calculating the total number of passes likely to be sold, an allowance must be made for new traffic induced as a result of the generally lower price levels provided by the joint passes. In Table 8, this is included, assuming a price elasticity of -0.25; i.e., for each percent of decrease in the average fare per trip, traffic increases by 0.25 percent.

TABLE 8 — MARKET AND SUBSIDY ESTIMATES — MONTHLY PASSES

Market Segment	Joint Pass Price	Subsidy per Pass	No Credit Card Sales		With Credit Card Sales*	
			Number of Pass Users	Annual Subsidy	Number of Pass Users	Annual Subsidy
1 — BART/Muni/AC Transit						
Daly City - SF (BART-Muni)	\$ 41	\$ 7	400	\$ 34,000	450	\$ 38,000
Intra-SF (BART-Muni)	27	7	2,000	168,000	2,000	168,000
\$ OR	16	9∇	6,900∇	2,000,000	6,900∇	2,000,000
Transbay						
Muni - AC Zone 1	\$ 48	3	1,400	\$ 67,000	1,600	\$ 77,000
Muni - AC Zone 2	56	4	225	14,000	275	17,000
Muni - AC Zone 3	64	5	25	2,000	25	2,000
BART - Muni	59†	7†	1,125	95,000	1,500	126,000
AC - BART - Muni	55†	20†	450	108,000	500	120,000
BART - AC	50†	9†	1,000	108,000	1,200	130,000
Eastbay (BART-AC)	36†	9†	3,000	324,000	3,300	356,000
Subtotals			9,625	\$ 920,000	10,850	\$1,034,000
BART interfaces with CCCTA, TDT, WCCTA, and LV	Varies	Varies	500	\$ 37,000	650	\$ 52,000
Totals (rounded)			10,000	\$ 960,000	11,500	\$1,100,000
\$ OR			14,500	\$2,760,000	16,000	\$2,900,000

NOTES: \* - Credit card sales only for passes costing more than \$25.

† - Weighted average pass price and subsidy.

§ - Alternative of honoring Muni passes on BART; includes reimbursement of non-commute travel by Muni pass on BART. See Table 9.

∇ - Average value; subsidy is \$20 for passengers using Muni feeder services, \$2 for those using BART only. Does not include about 100,000 other Muni pass purchasers who might make random use of these for non-commute trips on BART.

(Table 8 continued on next page)

TABLE 8 - MARKET AND SUBSIDY ESTIMATES - MONTHLY PASSES (Continued)

Market Segment	Joint Pass Price	Subsidy per Pass	No Credit Card Sales		With Credit Card Sales*	
			Number of Pass Users	Annual Subsidy	Number of Pass Users	Annual Subsidy

2 - Southern Pacific InterfacesPricing Principle:Feeder fares at half price

SP - Muni	\$ 58†	\$ 8†	3,500	\$340,000	4,000	\$385,000
SP - Samtrans	45†	5†	225	14,000	250	15,000
SP - Santa Clara	62†	6†	300	22,000	400	29,000
Totals (rounded)			4,000	\$375,000	4,600	\$430,000

Pricing Principle:Feeder service system pass is gratis

SP - Muni	\$ 50†	\$16†	4,000	\$770,000	4,000	\$770,000
SP - Samtrans	40†	10†	250	30,000	275	33,000
SP - Santa Clara	56†	12†	400	58,000	450	65,000
Totals (rounded)			4,600	\$860,000	4,700	\$870,000

3 - Future Possible Phases (showing only those with traffic  
requiring at least \$1,000 annual subsidy)

BART - Santa Clara	\$67†	\$ 8†	50	\$ 5,000	70	\$ 6,000
BART - Samtrans	41†-59†	5†	1,200	73,000	1,350	83,000
Muni - Samtrans	23	3	250	9,000	250	9,000
SCCT - Samtrans	25	3	100	4,000	100	4,000
Muni - Golden Gate	68†	6†	150	11,000	300	22,000
AC-LV and AC-WCCTA	Varies	Varies	120	7,000	120	7,000

\* - Credit card sales only for passes costing more than \$25.

† - Weighted average pass price and subsidy.



The current transfer arrangements between BART on the one hand and Muni or AC Transit on the other are the cause of revenue losses which are balanced by current subsidy payments. Introduction of joint passes involving BART will result in a reduction of the use of current transfers and, hence of the concomitant revenue losses. The subsidy estimates in Table 8 do not include any credits to the subsidy account for these loss reductions, even though they will be substantial in all cases except the alternative in which BART honors Muni passes within San Francisco. It is important, however for the MTC to consider whether reductions in other subsidy payments are warranted because of this phenomenon; if so, "before" and "after" counts of BART transfers collected by AC Transit and sold in Muni vending machines will provide a basis for the calculation of adjustments to be made.

8. Honoring of Muni Passes on BART. San Francisco officials have proposed that Muni passes be honored on BART for intra-San Francisco trips. If this were implemented, subsidy requirements would increase by about \$2 million per year.\* This assumes that Muni returns to the subsidy fund (or directly to BART) the "windfall" revenue received from sales of passes to passengers who will use them on on BART and to those who presently use transfer tickets to/from Muni feeder lines. The calculations are summarized in Table 9 and described in Appendix C. Muni would be able to reduce duplicating service in the corridor served by BART and redeploy these resources elsewhere (the principal reason for Muni's enthusiasm for this proposal); however, it is not proposed here that a specific adjustment to Muni's subsidy entitlement be made to recapture any financial benefits which might result.

Five eighths of the subsidy requirement shown in Table 9 results from reimbursements for off-peak travel on BART. About 100,000 Muni FastPasses are sold every month. Even though most pass purchasers do not commute in the Mission corridor traversed by BART, they would be offered the opportunity to take random trips on BART gratis. Since most of the pass holders are likely to work downtown, off-peak trips up and down Market Street are quite likely, as are evening and weekend trips.

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\*Preliminary results from another study place this figure at \$3 million, but this is based on different assumptions.

TABLE 9 — CALCULATION OF SUBSIDY REQUIRED IF BART HONORS MUNI PASSES  
FOR INTRA-SAN FRANCISCO TRIPS

	No. of Commuters	Present Revenue per Month (Dollars × 10 <sup>3</sup> )		Future Farebox Revenue per Month (Dollars × 10 <sup>3</sup> )		Monthly Subsidy* (Dollars × 10 <sup>3</sup> )		
		BART	None	BART	Muni	BART	Muni	Total
<u>BART + Muni Commuters</u>								
Using Muni Pass now	1,600	33.6	25.6					
Using Muni Pass on BART	1,825#			None	29.2	32.9 <sup>†</sup>	None <sup>††</sup>	32.9
Using transfers now	1,600	33.6	16.8					
Using Muni Pass on BART	1,800#			None	28.8	32.4 <sup>†</sup>	-8.8 <sup>††</sup>	23.6
<u>BART-Only Commuters</u>								
Using BART tickets now	2,900	60.9	None					
Using Muni Pass on BART	3,075#			None	49.2	55.4 <sup>†</sup>	-49.2 <sup>††</sup>	6.2
Totals { Now	6,100	128.1	42.4					
Future	6,700#			None	107.2	120.7	-61.2	62.7
Annual Total Commuters						1,450	-700	750
Annual Subsidy for non-commute trips §						1,250	-	1,250
Annual Grand Totals						2,700	-700	2,000

NOTES: \* - Minus sign indicates extra revenue received, which should be credited to subsidy account.

# - Includes estimate of traffic shifted from all-Muni trips to BART.

† - Assumes that BART will have introduced an intrasystem pass scheme, within which intra-San Francisco monthly revenue would be \$18 per pass.

†† - Assumes that Muni may retain revenue from pass sales to traffic shifting to BART from all-Muni trips in the BART+Muni category, since this will still use Muni feeder services; however, Muni does not retain revenues from pass sales to shifted traffic in the BART-Only category. Also makes no provision for Muni to return any of the operating cost savings caused by the shift of 600 commuters to BART.

§ - See Appendix C, Section C.2. for speculative assumptions used.

There is no accurate way to predict the quantity of Muni pass use on BART for non-commute trips. To arrive at some order-of-magnitude figure, it is speculated that each pass purchaser might make two round trips per month on BART. It is also assumed that BART might be persuaded to accept reimbursement of 25¢, rather than 50¢, for off-peak trips made on Muni passes on the following grounds:

- Off-peak trips add relatively little to operating costs.
- Trips are short — many of them only up and down Market Street.

On that basis, the 5 million trips, which result from the speculation described above and in Appendix C, would add \$1.25 million per year to BART's claim for subsidies under this program. This high cost could be reduced if a special pass for the BART corridor were used, instead of opening BART to all Muni FastPass purchasers. Of course, the \$27 pass shown in Table 8 is such an instrument. A special price of, say, \$20, could achieve the same goal; the BART travel privileges which would accompany the extra cost of \$4 would probably still be attractive to commuters in the Mission corridor, but not to other Muni pass buyers.

9. Honoring of AC Transit Eastbay Passes on BART. No arrangement analagous to honoring Muni passes on BART has yet been advocated for the Eastbay, but such a demand for equal treatment is certainly imaginable. A scheme could be set up within the Oakland/Berkeley area, roughly corresponding to AC Transit's fare zone 1. However, BART fares are not uniform within this area as they are within San Francisco, ranging from 50¢ to 85¢. This poses a difficulty in determining how the AC Transit Eastbay pass could be used on BART both equitably and in a manner which does not open loopholes. For example, a traveler from Bay Fair to Berkeley could pay 50¢ to travel as far as Coliseum, exit and reenter the system, use the AC Eastbay Pass for the rest of the journey, and thereby save 55¢ of the \$1.05 fare between Bay Fair and Berkeley. If the AC Pass were already in the possession of the traveler or a member of his household for other trips, such a savings might easily be worth the delay at Coliseum (if a San Francisco-bound train were to arrive first at Bay Fair, the traveler would not lose any time at all by this maneuver).

No calculation of the type which was performed for the BART/Muni proposal has been carried out for an Oakland/Berkeley equivalent, partly

because of the uncertainties of how such a system would work and be priced. But it seems likely that the additional subsidy costs would be in the range of \$1-2 million per year.

#### B. Single Ride Tickets/Transfers

While monthly pass purchase transactions take place in stations, terminals, or by mail, single-ride fare payment has traditionally occurred on the transit vehicle in the case of surface systems. "Self-service" fare payment, in which even single-ride tickets are purchased at vending machines placed at busiest bus and street car stops, and in which roving inspectors check passengers for possession of valid tickets, are found in several European countries, but have not yet made their appearance in the United States. The San Francisco Municipal Railway is seriously considering such a fare collection scheme, but it is unlikely that all major systems in the Bay Area would convert to self-service in the foreseeable future.

Therefore, while self-service fare collection would greatly simplify the sale and processing of single-ride intersystem tickets, it is necessary to propose a scheme which involves on-board fare collection. Such a scheme requires completion of development of a combination fare box-transfer printer, research into which is just beginning in the transit supply industry.

In the Bay Area, the presence of BART and Muni Metro fare gates complicates the problem. It is fairly simple to design a machine producing printed transfers for use on connecting systems which do not use magnetically coded tickets. However, the production of magnetically coded tickets on board buses and streetcars increases both the cost and space required, probably beyond what is presently feasible. Also, a single machine must be able to produce both intrasystem and intersystem transfers so that currently used paper transfers and the administrative burdens associated with them can be eliminated. If a bus system (AC Transit, for example) issues one transfer to BART for every 10 transfers to other AC Transit buses, and if all transfers had magnetic strips, there would be a great deal of waste. On the other hand, a machine which stores both paper tape for one type of transfer and magnetic ticket stock for another becomes unwieldy in the space which might be available near a bus door.

With these concerns in mind, and with the knowledge that several years will be required for technological development and to arrange capital financing, the following system is sketched out.



1. Equipment on Board Surface Vehicles. Surface transit systems are beginning to equip their vehicles with electronic fareboxes because of difficulties experienced with older boxes when handling dollar bills. The new boxes have the capability (among others) of processing and counting tickets ranging in size from  $1\frac{1}{2}'' \times 2''$  to  $2'' \times 5''$ . It will be very important for such machines to be available for the single-ride transfer processing; without them, vehicle operators will have to collect transfers manually and turn them in to dispatchers at the end of their runs.

Each surface transit vehicle will also require a transfer printer; it would be preferable, but not essential, to tie this into the electronic farebox. The transfer coupon contains the following information:

- a. Identification of system issuing transfer (permanently programmed into the machine when purchased).
- b. Date and route of issue (set by operator at start of run).
- c. Zone in which issued (set by operator at start of run, and changed if run crosses a zone boundary).
- d. Time of expiration (printed automatically from a time clock set far enough ahead of actual time to allow time for transferring).
- e. Direction of travel — e.g., inbound, south — when issued (set by operator at each route terminal).
- f. Price — this is the total fare due, not the price of the transfer.

This information appears in visible form for inspection by operators of vehicles to which the passenger transfers, and also in coded magnetic ink form to be machine-readable. Transfer tickets will be of a size which can be accepted by electronic fare boxes.

The printer includes a digital display visible to operator and passenger (as in cash registers) showing the fare due to the destination desired. The printer has stored within it the matrix of fares from all zones of the originating (machine-owning) system to all zones of all systems except BART. It stores data on transfers actually printed, which are retrieved by maintenance personnel at the end of the day.

Such a machine is still to be developed. Some work is now going on in designing a machine for installation in rail stations, but a machine small enough not to clutter up boarding areas in buses and streetcars is still in the future. If tied into the farebox electronically, the

machine can check that the correct amount of fare has been paid before issuing the transfer.

2. BART Station Equipment. Modification to existing ticket vending machines and new transfer "spitters" will be required. Passengers transferring from a surface system to BART pay the normal fare to the BART station on the feeder vehicle and receive an appropriately coded transfer. The BART ticket vendor must read the magnetic ink code and credit the passenger with half of the fare already paid (or all of it under another pricing plan) toward the purchase of a BART ticket, provided that date and time codes check out correctly. The passenger, if holding a large value BART ticket, can add the value of half (or all) the surface system fare to this ticket in the same machine, but only at the time of transferring.

For passengers leaving BART transfer tickets will be issued by ticket "spitters" in the paid area of stations. Unlike present transfer tickets, however, the new ones must include the magnetic ink code version of pertinent information in the same format as tickets printed on board surface vehicles. The transfers will be valued at one-half of the fare of the feeder trip, and the passenger must pay the other half of the fare in cash. (Under the option of free feeder service, the present procedures would apply.) A regulation must be promulgated and enforced by random inspection to prevent joint-pass holders from helping themselves to these transfers in order to pass them to local (non-BART) passengers waiting for surface transit vehicles outside the stations.

3. Pricing. Intrasytem transfer pricing is the province of each system; transfers may be issued free or for some additional fare payment.

The suggested intersystem transfer pricing is similar to the proposed intersystem pass pricing. The total cost of an end-to-end transfer ride will be the sum of the two individual fares less 10 percent. The cost of a feeder-transfer trip will be the cost of the rail trip plus one half of the cost of the feeder system trip. In the latter case, again a decision might be made to charge less than this, or nothing at all, for the feeder service.

4. Accounting and Subsidies. Each machine involved -- the on-board transfer printers, BART ticket vendors, and the BART transfer spitters -- provide

data on transfers issued. However, except when transferring to BART, there is no information as to the system to which the traveler transferred or, for that matter, whether the transfer was used at all. In many cases, a passenger must pay an extra sum on a surface vehicle to obtain an intersystem transfer, and one can surmise that the transfer will be used. But in those cases where no additional cash outlay is required for a transfer, they might well be discarded.

For accounting reasons, therefore, transfers are collected by surface vehicle fareboxes (operators, if fareboxes cannot handle them) and by SP ticket office personnel. If a transfer is to be used a second time, it is nevertheless collected at the system interface and a new transfer is issued to replace it. (Handling of intrasystem transfers is not affected by such accounting constraints.) Transfers used toward BART can be counted as they are inserted in ticket vending machines.

Each system reports at monthly intervals to the central accounting agency the amount of money collected by the sale of intersystem transfers and the number of transfers collected from each of its interfacing systems. The latter can be counted, but perhaps not stratified by system of origin, within the electronic fareboxes. In that case, each system must also obtain a magnetic-ink reader in its accounting office, or the central accounting office could do this for all systems if the collected transfers were sent to it.

Before a final design of transfer tickets and machines is adopted, the problem of ticket mutilation must be investigated. Counting may be slowed or become inaccurate if tickets are rejected by reading mechanisms because of mutilation.

Once the data are available and reported, the central accounting office again calculates the amount of subsidy due each system. It is possible that some systems may actually collect more revenue in their fareboxes than their entitlement after this calculation is made, in which case a negative subsidy is shown, requiring a payment from that system into the central fund.

5. Potential Market and Subsidy Requirements. Table 4 indicates that some 100,000 intersystem transfers are made weekdays at present. The monthly pass will accommodate perhaps 15,000 of these,\* representing twice that

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\*Assuming the pricing structure proposed in Section VI. A.

number of daily trips. Thus a starting figure for the single-trip transfer market is of the order of 70,000 weekday or 21 million annual trips.

Table 10 shows the markets for intersystem single-trip travel on an annual basis. The total of about 22 million includes some induced traffic. However, all figures must be taken as approximate in view of the assumptions which had to be made in arriving at them; not the least of these is, which of the alternate pricing schemes is adopted for passes and for the single-trip market. In this case, the recommended subsidy program — 10 percent discount for end-to-end transfers and 50 percent discount for feeder trips to/from rail systems — was used, but footnotes indicate the effect of free feeder trips to/from the SP, and use of the Muni pass for intra-San Francisco BART trips.

The subsidy required to support the entire regional program is shown in Table 11. It becomes important now to include the savings from abandoning the current transfer arrangements between BART on the one hand and the Muni and AC Transit on the other.

In the Eastbay, subsidy requirements of the new scheme should roughly equal the deficits engendered by the present scheme. Traffic from AC Transit toward BART should increase as the price drops from a full local fare to half that amount, but that in the other direction would decrease by a similar amount as the presently free transfer is replaced by a charge of half a local fare. In San Francisco, some data indicate that less than half of all persons transferring between BART and the Muni presently avail themselves of discount tickets. The others pay full fares to Muni. It seems that the present system is too complex and too little understood to be attractive to the majority of the market it is intended to serve. It has been assumed in this study that the new scheme would induce all persons to take the discounts, and that Muni should be reimbursed for the revenue loss caused by this shift.

These considerations result in Table 11 containing a zero figure for the BART/AC interface subsidy requirements, but \$750,000 for the BART/Muni interface. As pointed out earlier, some of the reduced deficits in the current BART transfer programs accrue to the monthly pass program, but it is assumed that the entire credit is applied only when the single-trip transfer program is inaugurated.



TABLE 10 - ASSUMED ANNUAL MARKET FOR  
SINGLE-RIDE INTERSYSTEM TICKETS  
(All Values in Thousands)

Between → and ↓	AC	Golden Gate	Muni	Sam- trans	Santa Clara	BART	SP	CCCTA	TDT	WCCTA	LV
AC		150	2700	100	25	WB-3000 EB-6000	x	x	x	50	25
Golden Gate			900	20	x	WB-5 EB-10	x	x	x	x	x
Muni				250	x	WB-2500§ EB-3000	750*	x	x	x	x
Sam- trans					120	WB-1000 EB-150	50*	x	x	x	x
Santa Clara						EB-160	100*	x	x	x	x
BART							x	WB-250 EB-450	WB-30 EB-50	WB-25 EB-35	WB-80 EB-150
SP								x	x	x	x
CCCTA									60	x	30
TDT										x	x
WCCTA											x
LV											
TOTAL (rounded): 22.0 million V											

(Symmetrical matrix -  
total market for both  
directions shown above  
the diagonal.)

NOTES: x - No interface.

EB - BART trip origin/destination in Eastbay.

WB - BART trip origin/destination in Westbay.

§ - 1,300 if BART accepts Muni monthly passes for intra-San Francisco trips, and if free single-trip BART/Muni transfers are offered.

\* - If feeder service to/from SP is provided free to pass holders and to single-ride ticket users, these amounts become:

Muni ↔ SP 500

Samtrans ↔ SP: 40

Santa Clara ↔ SP: 75

- If notes § and \* both apply, total becomes 20.5 million.

TABLE 11 - ANNUAL SUBSIDIES REQUIRED TO SUPPORT  
SINGLE-RIDE INTERSYSTEM FARE DISCOUNTS  
(Thousands of dollars - rough estimates only)

Between + and +	AC	Golden Gate	Muni	Sam- trans	Santa Clara	BART	SP	CCCTA	TDT	WCCTA	LV
AC		50	500	25	+	0	x	x	x	+	+
Golden Gate			200	+	x	+	x	x	x	x	x
Muni				50	x	750\$	200*	x	x	x	x
Sam- trans					25	150	10	x	x	x	x
Santa Clara						30	25*	x	x	x	x
BART							x	150	25	50	10
SP								x	x	x	x
CCCTA									+	x	+
TDT										x	x
WCCTA											x
LV											

(Symmetrical matrix -  
total market for both  
directions shown above  
the diagonal.)

TOTAL (rounded): \$2.25 millions ∇

NOTES: x - No interface.

· - Less than \$10 (thousand)

\$ - 800 if BART accepts Muni monthly passes for intra-San Francisco trips, and if free single-trip BART/Muni transfers are offered.

\* - If feeder service to/from SP is provided free to pass holders and single-ticket users, these amounts become:

Muni ↔ SP: \$250

Santa Clara ↔ SP: \$ 40

- If notes \$ and \* both apply, rounded total becomes \$2.4 million.

The "bottom line" of this analysis is that annual subsidies of the order of \$2.25 million would be required to reimburse transit operators for the single-trip transfer program when fully implemented, and assuming the 50 percent discount for all feeder travel to/from rail systems. The more generous transfer arrangements within San Francisco and the Southern Pacific corridor would raise this amount by perhaps \$150,000.

### C. Other Types of Fares

Other types of fares for the general public and for special groups must be mentioned briefly.

1. Annual Passes. Transit patrons can be offered the opportunity to contract for annual passes. This is best arranged by transit agencies through standard credit card accounts. The bank charges for this are partially offset by lower marketing and pass printing costs.

Purchasers of an annual pass sign simple contracts authorizing the cost of the pass to be charged to their credit card accounts at the beginning of each month.\* They are issued passes in a format identical to monthly passes, except that the expiration date is printed and coded for the end of the contract period. If the patrons later wish to cancel the contract, they can do so effective the end of any calendar month, but must turn in the pass some time before that date to the bank or transit agency, receiving in exchange a pass valid until the end of that month only.

Annual passes not only provide yet another increment of passenger convenience, but also add efficiency to the pass marketing and distribution program of agencies using them. A special discount (pricing the monthly installments slightly below the cost of a monthly pass) is not necessary, although it is used in Europe. Because of the minor inconvenience of cancelling the contract, it is likely that a pass holder who does not expect to commute regularly for a short period and who, under other circumstances, would forego buying a regular pass for that month, would not bother to take any action with respect to an annual pass; this would produce a small amount of extra revenue to the transit system.

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\*An example of such a contractual arrangement is found in the florist trade, where a floral gift is automatically delivered monthly and then charged to a credit card account.

The inclusion of annual pass contracts into a joint fare program for the San Francisco Bay Area is therefore highly recommended.

2. Short-Term Passes.

- a. Semi-monthly, biweekly, or weekly passes are all possibilities. Their attractiveness is mostly for long-distance markets where the cost of a monthly pass is so high as to generate sales resistance. However, the markets at these long distances are small. It is undesirable to attempt mixing monthly passes with shorter-term versions. The problem of high prices for some passes is probably better overcome by accepting credit card purchases.
- b. Daily passes are presently offered in Santa Clara County every day, and on several systems on Sundays and holidays. They are purchased on board of buses and streetcars. An intersystem version could be developed now without the complex technology described for single-ride tickets, but its use should be confined to the Sunday/holiday period when work load of vehicle operators permits handling this added task of fare administration. Eventually, the single-ride ticket/transfer printer described above could be readily programmed to issue day passes (an additional price matrix would have to be stored in each machine), but the inclusion of BART would require even more redesign of that system's fare gate technology than is now contemplated. Generally, interest in daily passes among transit operators appears to be rather low; hence inclusion of this fare-paying option is considered a low priority item.

3. Multiride Ticket Books. These are used on many systems. They have the advantages of passes (off-vehicle transactions, speedy vehicle boarding, cash flow and security improvement), except that they are not as attractive to purchasers in that unlimited rides are replaced by a measured number of trips. To include multiticket books alongside a system of passes complicates the entire scheme, including marketing, accounting, and on-system processing, to such an extent that this option is not recommended.

4. Intersystem Fares for the Elderly and Handicapped. An intersystem joint-fare scheme can include provisions for special prices for the elderly



and handicapped. Monthly passes and single-ride tickets can be offered using the same mechanisms and pricing schemes as for regular passes and tickets. In other words, a joint pass for the elderly would be based on the prices presently charged for passes sold to this group by individual systems, and so forth. Since all the data on markets and subsidies, given earlier, are based on grand totals of passengers, in which elderly and handicapped are included, and since the discount in absolute dollar terms for these groups would actually be less than that for regular passengers, the subsidies calculated may be slightly on the high side after corrections are made for programs of joint fares for elderly and handicapped travelers.

5. Intersystem Fares for Children and Youths. Although some systems, such as the Muni, are particularly generous in pricing children's fares, others offer relatively low discounts on single fares and no passes at all. This project did not look into the matter of consensus among regional transit operators on the desirability of making special provisions for young travelers, but again the proposed scheme is sufficiently flexible so that special joint fares for this group could be provided.

#### D. Farebox Recovery

Under various California subsidy legislation provisions, the farebox recovery ratio (farebox revenue divided by total operating costs) must be maintained above a certain level. For example, AC Transit, BART, and the Muni must all produce one third of their operating costs from the farebox in order to qualify annually for certain subsidy funds. The other systems must not allow their ratios to drop substantially below the levels prevailing in Fiscal Year 1980.

The joint-fare scheme poses a problem, in that some fare revenue is proposed to be replaced by a subsidy from TDA or other sources. To overcome this, a legal stratagem must be developed. This might consist of defining the program as one in which passengers purchase only a fraction of their passes or single-ride tickets, while counties use TDA funds to "purchase" the rest. The "subsidies" then become "payment for passes and tickets purchased", and can be counted as farebox revenue. Other revenues transferred from one operator to another counts as farebox revenue in any case.

### E. Marketing

While marketing programs are beyond the scope of this report, it must be pointed out that the proposed scheme presents some marketing difficulties. Because maintenance of individual system sovereignty is considered a major requirement of any regional scheme, the existing, rather disparate tariffs are retained. Were it possible to replace them by a single regional tariff, as, for example, in several major German metropolitan areas, a single catchy nomenclature could be developed. In the reality of the situation, however, there will be many combinations of passes, not to mention retention of intra-system passes which are already identified by such names as FastPass, Transbay Pass, and Orange Key.

No easy solution to identifying intersystem passes and tickets exists. It will be a great challenge to marketing specialists to facilitate understanding, and to promote sales of these instruments.

### F. Conclusions

In this section of the report, a total regional joint-fare plan has been described. As applied to the San Francisco Bay Area, it appears that, if adopted in toto, it might involve the sale of 15,000-18,000 monthly intersystem passes, requiring subsidies of \$1.5-3 million, and the use of over 20 million single-ride intersystem transfers annually at a subsidy cost of \$2.25-2.4 million. These data are broken out by major corridor projects and summarized in Table 12. The ranges in all these data reflect the two major options which have been left open: whether credit card sales for passes will be permitted, and how intra-San Francisco and SP corridor joint services are to be priced.

TABLE 12 — TOTAL ANNUAL SUBSIDIES BY CORRIDOR  
(In Thousands of Dollars)

Corridor Project	Monthly Passes	Single-Ride Transfers	Totals
BART/Muni/AC	925 - 2,900*	1,250 - 1,300	2,175 - 4,200*
Southern Pacific	375 - 875	250 - 300	625 - 1,175
All Others	150 - 175	750	900 - 925
Totals	1,450 - 3,950*	2,250 - 2,350	3,700 - 6,300*

\*Upper end of range speculative; see Section A.8 of this chapter.

In June 1980, the MTC set aside \$4 million of FY 1980-1981 regional subsidy funds to subsidize joint fares for the BART/Muni/AC portion of the region. Capital costs which might be incurred can also be subsidized from other funds. As shown in Table 12, this study indicates that \$4 million is ample for the monthly pass phase, and could suffice even after single-ride transfers are introduced. The main reason for this conclusion, which may seem surprising, is that the present transfer system involving BART is incurring annual deficits, whose eventual elimination will balance those of the proposed program at the BART/AC interface and offset some of the deficit attributable to BART/Muni transfers.

However, this project did not consider the possibility of offering free feeder service to/from BART for intra-Oakland/Berkeley trips, as a parallel to the proposal to do this for intra-San Francisco journeys. If such a plan were found to be feasible, it would add perhaps another \$1-2 million per year to the project.

## VII. IMPLEMENTATION STAGES

Three major factors determine the sequence and speed of implementing portions of the joint fare plan: administrative and financial agreements and arrangements, technological development, and attitudes toward the plan by the policymakers of the various transit agencies. The first is primarily a matter of negotiating contracts; funds for payment of subsidies have already been identified for at least parts of the project. The stages discussed here, therefore, assume that administrative and financial matters will be dealt with expeditiously, and that sequencing depends primarily on the problem of technology and the responsiveness of transit system directors to the plan.

Table 13 lists three phases, the first divided into parts, in which the joint fare system proposed for the San Francisco Bay Area can be implemented. No time scale is given, but one might look for completion of Phase 1 perhaps 12-18 months after the project is formally adopted and launched. Phase 2 could be implemented sooner, later, or not at all, depending on whether the directors of the Golden Gate Bridge District and of Samtrans accept the principle of monthly passes for their systems. Phase 3 must await completion of development of on-board electronic fare processing equipment, or adoption of self-service fare payment throughout the region, whichever occurs first.

The table does not show the minor interfaces, but their incorporation in the total plan is assumed. It also does not show that some intersystem transfer arrangements for single trips already exist (Table 3). It is assumed that these, and any new ones which might be arranged in the interim, would be superseded when Phase 3 of the project is implemented.

It will be noted that Parts 1 and 2 of Phase 1 can precede the point at which the BART system is integrated and the BART fare gate technology becomes the dominant factor leading to the pass design described earlier. During these early parts of Phase 1, an interim pass system of fairly simple design can be used; investment in anything more elaborate is not justified inasmuch as it will be obsolete within perhaps a year of its inauguration.

- For Part 1 - AC/Muni. Since involvement of the many Muni pass sales outlets would complicate the administrative burden of offering two versions of that pass, the AC Transbay passes become the basis for the temporary pass. Muni emblems, printed on decals, would be affixed to AC passes to validate them for Muni use. The Transbay



TABLE 13 — IMPLEMENTATION STAGES OF A JOINT FARE PLAN IN THE SAN FRANCISCO BAY AREA

(Some Numbers Rounded)

Phase	Part	Type of Fare	Technological Development Needs	Operator Attitudes	System Interfaces	Trips per Year* (Thousands)	Annual Subsidy (\$ × 10 <sup>3</sup> )
1	1	Monthly Pass	None	Acceptable	AC/Muni SP/Muni SP/Santa Clara (SP/Samtrans)#	1,000-1,150 2,100-2,400 180- 240 135- 150	85- 95 340- 770 22- 65 15- 33
1	2	Monthly Pass	Moderate	OK at Muni. BART to be convinced.	BART/Muni (intra-SF temporary arrangement).	4,000	2,000
1	3	Monthly Pass	Considerable	Acceptable in principle	BART/Muni (general) BART/AC BART/Muni/AC BART/CCCTA et al. BART/Santa Clara	2,100-5,300 2,400-2,700 270- 300 360- 390 30- 40	300-2,150 430- 485 110- 120 37- 52 5- 6
1	4	Monthly Pass	None	Acceptable	AC/Santa Clara AC/WCCTA and LV }	Minor Markets	
2		Monthly Pass	None after Phase 1	Passes not acceptable to Samtrans and Golden Gate now.	Samtrans/BART Samtrans/Santa Clara Golden Gate/Muni Golden Gate/AC Golden Gate/BART }	720- 800 60 90- 180	73- 83 4 11- 22
						Minor Markets	
3		Single trip †	Considerable	Probably acceptable	All §	20,500- 22,000	2,250-2,400

\* - Each pass holder assumed to make about 600 trips per year.

# - Free service on Samtrans to SP pass holders, as at present.

† - Daily passes could be included in this phase, if additional technology is developed and installed.

§ - Existing intersystem transfer arrangements (see Table 3) would be superseded at some savings in present deficits, which might be credited to the subsidy account.

Terminal and the offices of AC and Muni would handle all sales. The passes would have to be processed visually at Muni Metro stations.

- For Part 1 - SP Service. Any variant of the SP pass (monthly, weekly, 5-day) would be extended to one or two feeder systems by clearly stamping the emblem of this system (these systems) on the reverse side. Muni Metro use of these passes would also have to be via the manually operated gates.
- Part 2. The BART technical study now under way will determine how gates in San Francisco stations would have to be modified to process Muni passes.

Since the interim arrangements for Part 1 do not provide for automatic accounting of joint passes sold, procedures must be established at pass sales outlets to keep count of the number of decals or imprints issued.

Strong interest for other interim joint-fare arrangements has been expressed. While the goal of offering improved transit pricing as quickly as possible is laudable, some disadvantages must be listed:

- Some ad hoc schemes might become so popular that revising them to integrate them into a regional plan might become impossible.
- Several possible schemes depend on manual supervision, without which abuse would be likely. Requesting present employees to perform such new tasks might require renegotiating labor contracts; alternatively, new temporary employees might have to be hired.
- One proposal envisions joint sale of BART stored-fare tickets with AC and/or Muni passes in a package. However, besides the problem of enforcement (assuring that tickets and passes are not separated for use by one BART and one bus commuter), there is the incompatibility of the expiration date of the pass with the unpredictable date when the BART tickets might be used up.

Therefore, it seems preferable to move with all deliberate speed to implement components of the ultimate plan, but to resist the temptation to promote interim incompatible projects.

## VIII. PROJECT MONITORING GUIDELINES

The plan described in this report has a number of unique features, and its success or failure will be of interest to policymakers in other parts of the United States. Hence a monitoring system is recommended.

### A. Evaluation Criteria

The success or failure of the project, or of any of its components, should be judged on the basis of the criteria which were listed in Section IV.B. However, rather than feasibility, actual performance will be measured, using numerical data as far as possible.

1. Technological Performance — reliability of the equipment; number of breakdowns (and length of time before repairs are complete); problems of operation and maintenance of technological equipment; incidents of deviations from total security (i.e., forgery, abuse, etc.).
2. Operational Performance — improvements (if any) in passenger flow into surface transit vehicles, into and out of rail stations; improvement in dwell time at transit stops and overall travel speeds; changes in administering intrasystem transfers; traffic pattern changes, including diversions from/to other transit systems.
3. Financial Performance — impact on operating revenues and costs; effects on capital costs; cost of technological and security problems, if any.
4. Market Performance — market penetration in various markets; traffic attracted from private cars and other modes.

Not only the plan as a whole, but separate components and markets should be analyzed. One goal is to determine which parts of the total scheme are more successful than others, and why.

### B. Data Needs

Any study which attempts to detect the impact of changes generally collects data on the situation before the implementation of changes, and after the changes have been introduced. If the changes are of a drastic type, it is also important to project the do-nothing option — predict how the system would have worked at some future time had the project not been implemented.

Data of two types are useful:

1. Aggregate data. These are being increasingly produced by transit systems, partly as a result of new requirements by the U.S. Urban Mass Transportation Administration. These data should be sufficient to provide the "before" and "after" data for this project, especially since they will be supplemented in some cases by data produced by the project itself (from electronic sales, transfer/printing, and farebox equipment). However, it should be determined early in the project which data are important and which are not, so that only the necessary files be established and maintained.

Projection of the do-nothing scenario may be difficult, since it is most reliably done by extrapolating several years of "before" data. In several of the systems, data processing and auditing changes have recently occurred, so that "before" data may not be consistent. However, the joint fare project is not expected to have such major impacts that analysis of the do-nothing alternative would be important.

2. Disaggregate data. These include user surveys, traffic counts at specific locations (system interfaces in this case), performance of specific components or submarkets, and so forth. A survey of users of existing intrasystem passes of AC Transit and Muni is being conducted in 1980, and will be a useful input to the monitoring study. Similar surveys will be needed at various stages of implementation. Other disaggregate data will have to be planned for in detail as implementation proceeds.

#### C. Conduct of Study

This study requires minor amounts of work continuously, and major efforts only when sufficient experience has been gained and data collected to complete an analysis. The continuous work relates to collection and inspection of data produced by the transit systems in accordance with a data plan agreed upon, determination of the need for disaggregate data, and collection of these. It seems appropriate, therefore, that the continuing work become the responsibility of an analyst designated by RTA or MTC, assigned to this task on a part-time basis. The major effort, which includes choosing and using the optimum analysis methods, interpreting the results, and writing reports, could either be performed by the same analyst or by a special consultant.



In view of the fact that no positive statement about the speed of implementation of the project itself can be made, it is impossible to suggest a schedule for its monitoring study. It seems realistic, however, to plan on using no more than one year of "after" data for each major change implemented. The effects of the project should show up quite rapidly, since user behavior is expected to respond fairly promptly to fare structure changes.

D. Special Studies

Opportunities for special studies, which might reveal presently unknown phenomena, should not be overlooked. For example, if one transit system decides to permit credit card purchases of its passes, while another does not, the response to these different marketing factors should be explored. If pricing policies are experimented with, the response to such tests must be measured. Results may be easily transferrable to other metropolitan areas, and should therefore be reported.



## APPENDIX A

## ABBREVIATIONS AND SHORT NAMES

Transit Systems

AC Transit	- Alameda-Contra Costa Transit District
BART	- Bay Area Rapid Transit District
CCCTA	- Central Contra Costa Transit Authority
Golden Gate	- Golden Gate Bridge, Highway & Transportation District
LV	- Livermore Valley (zone name, not a transit agency)
Muni	- San Francisco Municipal Railway
Samtrans	- San Mateo County Transit District
Santa Clara	- Santa Clara County Transit District
SP	- Southern Pacific Railroad
TDT	- East Contra Costa Transit Authority (TriDelta Transit)
WCCTA	- Western Contra Costa County Transit Authority

Other Agencies

Caltrans	- California Department of Transportation
CPUC	- California Public Utilities Commission
MTC	- Metropolitan Transportation Commission
RTA	- Regional Transit Association
SFPUC	- San Francisco Public Utilities Commission
TOCC	- Transit Operators' Coordinating Council
UMTA	- Urban Mass Transportation Administration (U.S.)

Miscellaneous

AB 1107	- Act appropriating moneys generated by a special $\frac{1}{2}$ percent sales tax in Alameda, Contra Costa, and San Francisco counties.
FastPass	- Tradename for Muni's monthly pass
LRT	- Light rail transit (modern streetcar systems)
Muni Metro	- The light-rail portion of the Muni system
TDA	- Transportation Development Act (California)

## APPENDIX B

SYSTEM-BY-SYSTEM APPRAISAL OF OPERATOR ATTITUDES TOWARD  
POSSIBLE JOINT FARE PREPAYMENT SCHEMES

(Prepared June 25, 1980)

For the purpose of analyzing the opinions of each operator in a meaningfully comparative manner, six categories by which to determine the level of acceptance by the operators of the proposal were delineated.

- General Mechanics of the Proposal. This refers to the "nuts and bolts" adjustments necessary to implement a project of the type described in the interview, i.e., design and production of passes, logos, etc., coordination of pass sales, redistribution of revenues.
- Technological Adjustments and Difficulties. These entail the addition of new machinery or the creation of new technologies to implement or better facilitate the implementation of the project.
- Financing Joint-Fare Implementation. How much will the project cost under various discount schemes? Where will the funds for its administration come from?
- Marketing Potential. Is there a market for a joint-fare prepayment scheme? How much of a discount will be necessary to make a joint pass attractive?
- Operations Ease. How difficult will it be for operations personnel to adjust to a joint pass system?

Information and Accountability. This category covers a range of problems. How will the accuracy of ridership and revenue data be affected by the incorporation of a joint pass scheme? How serious is the potential for fraud and counterfeiting?

1. AC Transit

The individuals representing the planning, marketing, and operations sectors of AC Transit generally favor initiation of a joint-fare prepayment plan. They were forthcoming with criticisms and suggestions, many of which facilitated the tentative design of our proposal. Some variations in opinion, of course, persist within the organization.



However, it can fairly be stated that these differences do not appear great, and that within each of the functional divisions at AC even these variations disappear.

The mechanics of the plan meet with unqualified approval from the marketing and operations people. In the opinion of the Manager of Marketing, the proposal is "beautifully simple" and presents no problems for the drivers and other operations personnel. From the perspective of the planners, Don Larson indicated that the proposal seems reasonably workable, but offered a suggestion to simplify its implementation even more. He suggested selling two (or more) system passes in a pouch and discounting the combination. For instance, a transbay commuter wishing to use Muni's services would purchase an AC Transbay Pass and a Muni FastPass in a pouch, and thereby receive some discount. He conceded that there might be a greater psychological inducement for patrons to purchase a single joint-fare pass.\*

The question of the marketing potential for a joint pass where one or both single system passes is already priced high is a concern to all of those interviewed at AC. Although Mr. Larson, for instance, indicated that transit ridership price elasticity is possibly less than most believe, the prospects of riders budgeting themselves on the order of \$50 per month for transit is another matter. This question would have to be verified empirically.

This problem leads to the next set of issues in any joint-fare scheme. The most vexing concerns for AC are the possible discount levels. If the passes are not discounted somewhat, they will be unmarketable. But if discounts are significant, the revenue losses could be detrimental to all aspects of service. The prevailing option here is that discounts should be kept minimal, unless regular fares are artificially raised as a method of subsidizing the joint-fare prepayment program.

Whatever determination is made of discounts in such a scheme, the proportion of that discount must be included as part of the 33 percent farebox recovery demanded by MTC and California state legislation for

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\*It might be easy to abuse such a system, if AC commuters and Muni commuters paired up to purchase such a package at a discount, and then each took the pass for his system.

disbursement of state subsidy funds. In addition, the amount of the discount plus administrative costs for joint pass implementation should and probably will have to be subsidized. At this point, the planners join in chorus to inquire of the source of subsidy. There is considerable skepticism concerning the availability of excess funds from TDA or elsewhere for such subsidy.\* When the planners of AC are convinced that financing exists for the present and future implementation of the joint-fare prepayment demonstration project, they are likely to embrace the scheme.

One area of some concern, particularly to Mr. Larson, is the possibility of abuse of the system in the form of pass counterfeiting. A couple of feeble attempts were made to fraudulently duplicate the AC Transbay Pass, but the copies were poor. There is some concern that more successful attempts have passed undetected. Mr. Mills, the Marketing Manager and designer of the pass, believes that it is a difficult and expensive task to copy an AC pass. Consequently, he believes that successful counterfeiting will be minimal or nonexistent.

## 2. BART

BART presents unique problems to any joint pass system, and the one proposed is no exception. Of those interviewed, including John Glenn (a director), Keith Bernard (General Manager), Howard Goode (Planning Director), and two other planners, some enthusiasm was expressed for a joint pass project. BART is perhaps the only system whose representatives spoke of increasing usage, particularly during off-peak hours. Fraud and information accountability do not strike the BART staff as serious problems.

The most serious difficulty in adopting a joint-fare system for BART or vice versa is the technology required to alter the present fare gate system to accept a pass. There are three major possibilities to solving this impasse.

- Use of an "edge reader" to read passes only, with the capability of overriding the circuitry of the present fare gates.
- Rewiring the present fare gates to accept passes.

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\*These interviews predated the setting aside by MTC of \$4 million for subsidizing a joint-fare project involving AC, BART, and Muni.

- Use of station agents to operate emergency gates manually for pass holders.

BART management has ruled out the last of these possibilities. The solution to the problem, then, involves the addition of new technology or the modification of present technology. In BART's case, this is not simply a matter of adapting their system to be compatible with our joint-pass proposal. Discussions with the Municipal Railway are underway to implement a system which could utilize the Muni FastPass and facilitate BART's interface with Muni Metro. At this time, it appears from interviews with William Kritikos, Barbara Neustadter, and Howard Goode, that a type of "edge reader" was the technology of preference. However, Mr. Goode emphasized that BART is hesitant about tinkering with its fare gates for short range purposes which may conflict with long range plans. In relation to this problem, he suggested that the present fare gate system may have the capacity to incorporate pass usage, utilizing a different logic.

Financing the introduction of edge readers or the alteration of the present machines does not seem problematic to the individuals at BART. However, there is concern over subsidizing discounted joint passes. Mr. Bernard seems to favor cross-subsidies from regular fares. BART management shares the concern of AC Transit officials that subsidized discounts should be included as part of farebox recovery. And the skepticism about the marketability of high-value passes is shared by BART. They concede, however, that these are empirical questions which have to be answered with a certain amount of trial and error.

### 3. Muni

The general manager of the San Francisco Public Utilities Commission (SFPUC) and Muni's planners have given unqualified support to a joint-fare prepayment plan in general and to our proposal specifically. It is the belief of the individuals at Muni that the mechanics of the plan are simple enough, that little would be required by Muni to adapt its FastPass operation to a joint pass system. There are no technological difficulties, except for the interface of Muni with BART, a problem which exists irrespective of a regional joint fare prepayment scheme. From an operations perspective, the proposal presents no difficulties.

The Muni is in the midst of planning a self-service fare system to be implemented within two or three years. A regional pass system, in their view, would facilitate Muni's own objectives. However, it appears that initiation of a "free zone" or "free transfer zone" in downtown San Francisco for holders of other system passes will not be workable until the implementation of self-service fares on the Muni.

Of all the systems, Muni seems not to be apprehensive about fraud and counterfeit problems with joint passes. The present fast pass has not generated many difficulties for them, and the joint pass should not prove a worrisome problem with counterfeiting.

Muni officials do not regard financing a joint pass system with any appreciable alarm. Richard Sklar, SFPUC General Manager, is firmly convinced that plenty of money exists for a project of this sort. The planners concur with his judgment. However, Luther Freeman added an important caveat to whatever financial arrangements are considered. He suggested a possible backlash from San Franciscans if any discounting for the joint pass is perceived by San Franciscans as being subsidized out of their pockets. Assurances of TDA or other subsidy would allay any fears on this account.

Muni appears ready to begin to coordinate with other operators toward implementation of a joint-fare prepayment system. The planners at Muni foresee no encumbrances in interfacing with other bus lines. However, BART's concerns over technological incompatibility and the compromises necessary to work out differences are echoed at Muni.

#### 4. Santa Clara County Transit

Santa Clara is another enthusiastic advocate of a joint pass system. No objections were voiced by James Lightbody concerning the workability of the proposal in which Santa Clara would be a participant. He believes his board, and certainly the general manager, will agree to participate in a joint-fare prepayment project. Santa Clara is unique in that it is the only system with a surplus of revenues. Consequently, the financial woes of others do not seem to apply here. Moreover, the policymakers and planners at Santa Clara are attempting to encourage ridership and use of transit in that county. A joint fare scheme would mesh with their own goals.



Santa Clara's primary interest in participating in a joint-pass program is in developing a better interface with Southern Pacific. Mr. Lightbody stated that Santa Clara would like to develop more feeder bus lines to the Southern Pacific. A discounted joint pass would encourage the use of both systems. There is not a large market for other interfaces, except for a limited interface with Samtrans.

There exists some skepticism at Santa Clara over the marketability of the joint pass. Sales of Santa Clara's own passes have been small, and the extra cost for the privilege of using another system might be too much for most patrons. A major part of the problem of pass sales at Santa Clara appears to be the size of the county and the poor distribution network which presently exists. The utilization of credit card purchases by mail might eliminate the problem of the diffuseness of pass distribution there.

Mr. Lightbody has made the suggestion that a joint-fare prepayment system might be inaugurated by introducing a Sunday regional excursion pass. This suggestion has fallen on deaf ears in the offices of other operators.

#### 5. Southern Pacific

The representatives of Caltrans who headed the negotiations for the transfer of management of the commuter services to the State of California had no disagreements with the joint-fare prepayment plan. The 30 percent subsidy of SP ticket prices, which was financed from TDA funds, is being discontinued. Therefore, the incorporation of SP into a joint fare scheme seems appropriate and certainly marketable, according to Joe Browne and Cecil Smith. However, in spite of the favorable attitudes on the part of Caltrans and the receptivity of both Santa Clara County Transit and Samtrans, a great many variables persist which have not been quantified. There is still uncertainty with respect to the unions at SP. The California Public Utilities Commission retains its regulatory function over all fares.

Regarding discounts for joint passes, Caltrans has indicated that SP is budgeted completely according to standard, non-discount fares. Again, complete subsidy would probably be required to make up the deficit caused by discounts. At present, SP trains are at capacity

and, until new rolling stock is acquired, there is no room for the increased market possibly created by joint-pass sales.

There appear to be no obstacles to the inclusion of SP into a pass prepayment plan once the various negotiable uncertainties which persist for Caltrans and SP are resolved.

#### 6. Samtrans

The planning staff at Samtrans reacted favorably to the specifics of the tentative plan. Their primary concern was the issue of statistical accountability under a prepaid system. The problems were discussed, and the planning director and his assistant indicated that they believed their concerns could be accommodated.

Some weeks later, the general manager was asked to appraise the plan's merits and drawbacks. The issue of accountability is one that is not open to compromise in his view. Samtrans is the only bus system in the Bay Area which keeps 100 percent statistics on all its runs of all its ridership. The imposition of a pass system would leave the operation open to fraud as well as counterfeiting. Mr Mauro believes that patrons and bus drivers remain honest as long as something is offered in payment at the time of boarding. It is difficult to defraud the operation if other passengers can see money or transfers actually being deposited in the farebox. This safety mechanism of other riders' observations is negated with the use of a pass.

Furthermore, the general manager indicated that there was no market for a bus-system-to-bus-system pass. The present transfer arrangements with Santa Clara are satisfactory into the foreseeable future. He did indicate that a definite possibility existed for a joint pass to be worked out with Southern Pacific. Methods for keeping track of fares and passengers under a bus-to-train and vice versa pass arrangement are much simpler. Overall, however, Samtrans regards a joint-fare prepayment project with little acclaim, and places it rather low on their scale of priority.

#### 7. Golden Gate Transit

The opinions of the planning and operations directors and the general manager, were solicited regarding this project. To state flatly that Golden Gate is not interested in the scheme is perhaps a little too

forthright. However, five conditions work against the likelihood that Golden Gate Transit will opt at this time to join a prepaid pass program. First, as Jerome Kuykendall has insisted, there is no real market for Golden Gate to interface with other systems in the RTA. Second, the exact same concerns regarding the possibility of fraud and counterfeiting expressed by Samtrans' John Mauro are present at Golden Gate. Three cases of counterfeiting have been uncovered, where a discount ticket was fraudulently duplicated.\* Third, a great deal of skepticism exists over the source of any subsidy funds for such a project. The use of discounts for transit riders is not popular either. Fourth, the price of a joint pass would be astronomical, and the belief at Golden Gate is that patrons would not budget themselves that extensively. And last, the issue of a joint pass is not a compelling one for the Board of Directors and would not be popular. Dale Luehring tempered this last point by indicating that the Board is taking a "wait and see" approach to the Muni-Golden Gate Ferry interface just commencing. If this project is successful, Golden Gate may be willing to consider joining a pass network. Philosophically, the individuals at Golden Gate favor a joint pass system, but qualify it by adding, "In Europe it would work fine, but not here. The political hurdle would be damned near impossible."

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\*It should be noted that Golden Gate uses "Globe" ticket stock, which can easily be purchased and is easily duplicated. This was brought to the attention of the bus operations manager, but he was unwavering in his disapproval of passes and discounts.

## LIST OF TRANSIT SYSTEMS PERSONNEL INTERVIEWED

AC Transit

Don Larson — Manager of Planning  
Gene Gardner — Assistant Manager of Planning  
Ted Reynolds — Planning Staff  
Anita Winkler — Planning Staff  
Loren Ball — Manager of Operations  
George Grandison — Assistant Manager of Operations  
Mike Mills — Manager of Marketing

BART

John Glenn — Board Director, District 5  
C. K. Bernard — General Manager  
Howard Goode — Planning Director  
William Kritikos — Planning Staff  
Barbara Neustadter — Planning Staff

Golden Gate Bridge, Highway, and Transportation District

Dale Luehring — General Manager  
Don White — Manager of Bus Operations  
Jerome Kuykendall — Planning Director

San Francisco PUC and Municipal Railway

Richard Sklar — General Manager, SFPUC  
Peter Straus — Planning Director, Muni  
Luther Freeman — Planning Staff, Muni  
Frank Bauer — Assistant Operations Director, Muni

San Mateo County Transit District

John Mauro — General Manager  
Lawrence Stueck — Planning Director

Santa Clara County Transit District

James Lightbody — Senior Transportation Engineer

California Department of Transportation, District 4 (SP program)

Joe Browne — Chief, Transit Development Branch  
Cecil Smith — Senior Transportation Engineer

Metropolitan Transportation Commission

Joseph Bort — Commissioner (Alameda County Supervisor)  
Lawrence Dahms — Executive Director

Southern California Rapid Transit District

Jack Gilstrap — General Manager  
Paul Taylor — Planning Director  
Joel Woodhull — Scheduling Director



## APPENDIX C

BASIS FOR CALCULATIONS OF THE EFFECT OF HONORING  
MUNI MONTHLY PASSES ON BART FOR INTRA-SAN FRANCISCO TRIPSA. Present Traffic

1. Commute trips within San Francisco using both BART and Muni (from source in footnote a. to Table 4) = 6,400, or 3,200 commuters.
2. Total intra-San Francisco trips on BART 6 - 9 am (From DAS data for 16 July 1980) = 6,100 = 6,100 commuters.

It is assumed that non-commute trips in this period are balanced by commute trips outside this period. However, the total is likely to be low, since colleges were on vacation or summer session.

3. Hence, BART commuters not using Muni feeders =  $6,100 - 3,200 = 2,900$ .
4. Off-peak BART travel patterns are not considered to be a useful guide to predict use if Muni passes were honored. See C.2 below.

B. Present Fares

To calculate present commuter fares, 21 work days per month are assumed. The following present transit costs then apply:

- a. BART only - \$1.00/day = \$21.00/month.
- b. BART + Muni using transfer tickets - \$1.50/day = \$31.50/month.
- c. BART + Muni using a pass on Muni - \$16/month + \$1.00/day = \$37.00/month.

It is known that many BART + Muni passengers do not use the transfer ticket system. Twenty percent use Muni at both ends of the BART trip and therefore have monthly costs of \$42 rather than \$31.50 shown above, unless they use a Muni pass; they are assumed to do this. Another 30 percent are assumed to buy the pass because of its usefulness for other trips. Hence, half of all BART + Muni commuters are assumed to use passes, and half transfer tickets.

C. Shifted Traffic

1. Commuters: In the absence of detailed information, it is assumed that commuters will shift from all-Muni travel to Muni + BART or all-BART travel in response to the lower cost according to an elasticity factor of -0.25. No estimate has been made of induced traffic from automobile commuting, but this is probably too small to affect the rounded totals.
2. Non-commute trips: Here a great difficulty arises. Honoring Muni passes on BART presents new travel enticements to persons holding passes for commute reasons. They may use these passes for personal business, shopping, recreation and other purposes. This would apply primarily for trips up and down Market Street, to a lesser extent to trips in the Mission Corridor. These trips may be made on foot or on Muni now; hence there is no reliable message in current BART patronage figures.

A pure guess is that an average of two BART round trips per month will be made for non-commute purposes by each Muni pass holder. Muni sells just under 100,000 passes per month now, and probably somewhat over this number if the passes are honored on BART. The above guess then leads to an estimate of 400,000 non-commute trips on BART per month, or 5 million per year.

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